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ALGÆ OF NORTHWESTERN AMERICA

BY

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AND

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ALGÆ OF NORTHWESTERN AMERICA.

INTRODUCTION.

No account of any completeness, or of pretension towards completeness, of the algæ of the northwestern coast of North America has ever been published. Various accounts have been written and odd references have been made in general and special works, but nothing which has brought together all the available materials. We have been at work for some time trying to obtain such a knowledge as to warrant the attempt, and in the following pages we shall try to bring together all that is known to us, either from specimens or from the literature, of the algæ of the region known as the Northwest Coast. Unfortunately, the specimens from which the earlier accounts are drawn, are all preserved, as many as still survive, in various European herbaria and are, as yet, inaccessible to us. We have tried, however, to make full use of such study as has been made of these in the later days and published or communicated to us. While we have tried to discuss, or at least to mention, every alga credited to our territory, we have laid the greatest stress upon the results of our own studies in the field and upon specimens communicated to us, or otherwise accessible. This account, then, represents largely our own experience in attempting to obtain a knowledge of this algal flora.

GEOGRAPHY.

The limits set for this account, from the geographical point of view, range from Cape Flattery at the northwestern corner of the State of Washington, northward along the coast to the region of Kotzebue Sound on the Arctic coast of Alaska. This general region is chosen for several reasons of algal distribution. The study of the algæ of the entire western coast of North America has made it fairly plain that there are four, or possibly five regions of algal growth on the western

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coast of North America, well marked off, viz.;—the Boreal, the North Temperate, the North Subtropical, and the Tropical Regions. The Tropical Region is almost unknown as regards its algal inhabitants, but from data existing in our collections, seems to have its northern boundary somewhere in the neighborhood of Magdalena Bay, on the coast of Lower California in the Republic of Mexico. It may be characterized roughly by the absence of even the warmer water Laminariaceæ and the abundance of Sargassaceæ, Dictyotaceæ, and other tropical groups. From the northern limit of the Tropical Region, there extends northward a Subtropical Region which has its northern boundary fairly sharply marked by Point Conception in Santa Barbara County in the State of California. This region is characterized by the presence of Laminariaceæ of the warmer waters, such as species of Eisenia, Pelagophycus, and Egregia (*E. lævigata* Setchell), by certain Dictyotaceæ, as well as warmer water Rhodophyceæ, all of which are either strictly limited to the northward by Point Conception, or else are to be found only in warmer isolated areas above it. On passing to the north of Point Conception, a decided change is experienced in the composition of the algal flora. The groups just mentioned are absent, and certain species characteristic of the colder waters to the north are met with, mingled in certain favored and sheltered localities with species of warmer waters. None of the strictly subtropical Laminariaceæ are met with, except occasionally the last one mentioned. No Sargassaceæ are found, nor any of the Dictyotaceæ, at least none have been found growing. In turn, we meet with the Nereocystis of the colder waters, with certain species of Laminaria, with the northern Egregia (*E. Menziesii* (Turner) Areschoug), and with other colder water forms, less striking, but no less characteristic of this region. The algal flora of the Temperate Region remains fairly unchanged until we come to Puget Sound, when we find many of its characteristic species intermingled with those of the Boreal Region. The species characteristic of the Boreal Region, extend to some extent, at least, into Puget Sound, intermingling there with the species of the warmer waters to the southward and the latter, in turn, in some special cases, extend even farther northward to the region of

Sitka, or even to Yakutat Bay or farther west on the shores of the Gulf of Alaska. When we enter Bering Sea, however, even many species, characteristic of the Boreal Region in its lower part, stop but some continue on even into the northern part. There are some reasons, at present not supported by as strong evidence as may be desired, for believing that it may be necessary ultimately to distinguish between an Upper and a Lower Boreal Region. The distribution of Thalassiophyllum, and of a few other species point toward this. The Boreal Region is to be characterized by the occurrence of *Laminaria saccharina* in various forms, certain Alariæ, certain digitate Laminariæ, Chorda, *Rhodymenia pertusa* (P. & R.) J. Agardh, forms of *R. palmata*, Agarum etc., to say nothing of the large and conspicuous *Alaria fistulosa* P. & R. which, however, is one of the species which does not extend down into the vicinity of Puget Sound. The Boreal Region has a distinct admixture of Arctic and North Atlantic species, or of species allied to these and distinct in type from those of the North Temperate Region. As we proceed north into the Bering Sea, this Arctic cast becomes more distinct as the number of species becomes less and many of the characteristic species of the Lower Boreal are conspicuous by their absence. Of the Arctic coast of Northwestern America, we know nothing, or practically nothing, of the algal inhabitants.

In this account, we have included such of the Aleutian Islands and the islands in Bering Sea as belong to the United States, more for reasons of convenience than any that are purely geographical or floral. An account of the species of Bering Island and of the Ochotsk Sea would come naturally into a consideration dealing with the shores of the Bering Sea, but for reasons of lack of opportunity of examining specimens from these shores, must necessarily be omitted.

We have spoken of regions of distribution, as may be plain from the text, from the point of view of the marine algæ. We have included in our account the species of the fresh waters and damp places of the coast country also, since the materials have come to us with the other, but as regards distribution, they do not fall into line with the marine species.

The physical geography of the Northwest Coast is, in general,

very different from the coast of North America to the south. Instead of a bold and even coast, with few deep harbors and few islands, the Northwest Coast is much indented and bordered by islands, or in fact archipelagoes, throughout much of its extent. This is significant when we are considering the question of distribution, for the greater portion of the collecting has been done in the inner and more sheltered portions of the coast, and may account for the absence of some species considered characteristic of the next lower region.

The temperatures of the surface waters are of extreme interest to us, because they are the principal factors concerned in limiting distribution and bringing about the existence of general geographical regions of distribution.

One of us (cf. Setchell, 1893) has already shown that a change in the kelp-flora takes place with the increase of every five degrees (C.) of surface temperature. The present idea of regional distribution on the western coast of North America bears out the same idea. The statement is crude, because the data are not extensive and exact enough. The average difference between the maximum and minimum of temperature for a given region is in the neighborhood of five degrees also. While the isotheres and isocrymes can be plotted only roughly at present, we find reason for believing that the isocryme of 5° C. and the isothere of 10° C. pass just below the Aleutian Islands or about the southern limit of the Upper Boreal Region; that the isocryme of 10° C. and the isothere of 15° C. pass through the Strait of Juan de Fuca or somewhere near there and correspond nearly to the southern limit of the Lower Boreal Region; that the isocryme of 15° C. and the isothere of 20° C. pass through Point Conception or near it and correspond nearly with the southern limit of the North Temperate Region of our coast; and that the isocryme of 20°C. and the isothere of 25° C. pass near Cape San Lucas, or near the southern limit of our Subtropical Region. Although there is need that these isothermal lines be determined as to position on our coast with much greater accuracy, yet the coincidence of the lines mentioned as determined by the temperature of the surface waters and the limits of the geographical regions determined by a study of the distribution of the species of algæ, is certainly

striking and seemingly of much importance in the determining of the laws governing the distribution of these plants as well as of the physiological significance which regulates the whole matter.

HISTORY.

The history of the collections of, and publications on, the algæ of the northwestern coast, is inseparably linked, both historically and geographically, with those of the Ochotsk Sea and Kamtschatka. These coasts and those of the Bering Sea form the important portion of our Upper Boreal Region of algal distribution. The first collections were made by Steller on the shores of Kamtschatka between the years 1742 and 1745. The algæ collected by this great naturalist were described by Samuel Theophilus Gmelin in his Historia Fucorum, published at St. Petersburg in 1768. This general work, the foundation of algological literature, gives the first mention of a number of our species. The first to collect algæ strictly within the limits of our territory was Dr. Archibald Menzies, who visited the Northwest Coast in a trading vessel somewhere between 1779 and 1786, and again in 1792, 1793, and 1794, as a member of the Exploring Expedition in command of Captain George Vancouver. His collections were figured and described by Dawson Turner in his monumental work, Fuci, published from 1808 to 1819, but a few of them were named and imperfectly described by E. J. C. Esper (1802) from fragments sent to him by Turner without a suspicion that they were to be used in that way. Adelbert von Chamisso, poet and botanist, collected many algæ, as well as other plants, in the expedition under Captain Otto von Kotzebue on his first voyage in 1816 and 1817, and these were described chiefly by C. A. Agardh in the years 1821 and 1822. In the years 1826 to 1829, various portions of the coast of Northwestern America were visited by the exploring expedition under the command of Captain Frederic Lütke. In the ship Seniavin with Captain Lütke, were the botanists Alexander Postels and Henry Mertens, the former of whom made the series of magnificent drawings later published in connection with Ruprecht in the Illustrationes Algarum, while

Mertens collected and made notes, some of which, communicated in the form of letters to his father, Professor Mertens in Bremen, were published in 1829 in von Schlechtendal's journal Linnæa. In the ship Moller, one of those of Lütke's expedition, in command of Captain Staninkovitch, was Kastalsky, who collected some fine materials which were published, with those of Mertens and Postels, in the Illustrationes Algarum. From these sources, many specimens were carried back to St. Petersburg from Sitka, the Peninsula of Alaska, Unalaska, the Pribilof Islands, and Kamtschatka. The drawings and specimens formed the basis of Postels and Ruprecht's large and splendid work, the Illustrationes Algarum, already referred to. This was published in 1840 and has always been rare. At about the same time that the Lütke Expedition was exploring the shores of Bering Sea, the expedition under the command of Captain Frederick William Beechey was visiting the shores of Port Clarence and Kotzebue Sound. The naturalists of the Blossom, Beechey's vessel, collected many of the higher plants, but apparently only one seaweed was brought back. This and the algæ of other coasts, collected on this expedition, were described by William Henry Harvey in Hooker and Arnott's Botany of Beechey's Voyage (between 1839 and 1841). The St. Petersburg Academy of Sciences sent Wosnessenski on a ten years trip of scientific investigation of the shores of Russian America and he collected many algæ in California and the Ochotsk Sea, possibly also some on the Northwest Coast. Dr. F. J. Ruprecht examined all the collections from the Sea of Ochotsk, and especially those brought back by Middendorf, and published the results in his Tange des Ochotskischen Meeres in 1851. This work is full of references to species and specimens from our territory and of notes on their occurrence, comparisons with similar or identical species of other regions and is to be accounted one of the most valuable contributions to the algology of the Northwest Coast, although ostensibly dealing with another region. Another exploring expedition to visit the coast and bring back collections of algæ, was the United States Exploring Expedition, under Commander Charles Wilkes, which visited the region of Puget Sound and adjoining coasts in 1841. The new species of algæ were published

by Harvey and Bailey in 1851 and the final enumeration by the same authors (cf. Bailey and Harvey) appeared in 1862. Meanwhile more settlements had been made in the territory covered by this account, and odd collections had found their way to various algologists. One of the most important was the one made by Dr. David Lyall in the region of Esquimalt, B. C. and in some other portions of Puget Sound, and sent to Professor William Henry Harvey, at Dublin, who enumerated them and described the new species in 1862. The most recent of exploring expeditions to visit any portion of the coast was that of Nordenskiöld in the Vega, which came down through Bering Strait in 1880 and visited Port Clarence and St. Lawrence Island within the limits of our territory. Professor F. R. Kjellman, the botanist of the expedition, collected algæ at these localities and later enumerated them in 1889, in his paper, Om Beringhafvets Algflora. A short paper by one of us (cf. Setchell, 1899) on the Algæ of the Pribilof Islands was one result of the efforts of the Commission on Fur Seals and Fur Seal Islands to exploit the fauna and flora of those islands and the algæ collected by the Harriman Alaskan Expedition of the summer of 1899 were enumerated and described by DeAlton Saunders in 1901. The Corallines with jointed fronds of the region about Port Renfrew by K. Yendo in 1902 and scattered references in the works of J. G. Agardh and W. G. Farlow represent well all the remaining literature directly dealing with our territory. We have carefully studied all of the literature mentioned above and have attempted to incorporate the references to species and localities in the following account, placing each under its proper species, as we have recognized it, so far as we have been able to do so.

COLLECTIONS.

While the collections mentioned in the preceding paragraphs have been for the most part inaccessible to us, a very considerable amount of material has been brought together from the Northwest Coast, probably the largest collected together in any one place and has formed the basis for the present enumeration.

It may be described as follows:—in Herb. D. C. Eaton, a number of species collected through the courtesy of the Alaska Commercial Company and mostly numbered, named, and the duplicates distributed to Herb. Farlow and to our own collection; in Herb. University of California, a few specimens labelled as being from Bering Sea, collected in 1872, but without farther notes; a collection made at the Pribilof Island of St. Paul, in 1895, by Charles H. Townsend of the U. S. F. C. Str. Albatross, under the directions of the U. S. Commissioner of Fisheries; a collection in the years 1896–97, made also at the Island of St. Paul, by A. W. Greeley and R. E. Snodgrass, by the direction of President David Starr Jordan, then acting as head of the U. S. Commission on Fur Seals and Fur Seal Islands; collections made in the summer of 1899, at various points in Norton Sound, Alaska, by H. M. Rhodes and P. M. Newhall, of the U. S. C. & G. S. Str. Patterson, under J. F. Pratt, Assistant U. S. C. & G. S. in charge; collections in various parts of the eastern side of Bering Sea, made in the summer of 1900, by R. C. McGregor of the U. S. C. & G. S. Str. Pathfinder, in charge of J. J. Gilbert, Assistant U. S. C. & G. S.; collections made in the summer of 1894, by Charles H. Townsend of the U. S. F. C. Str. Albatross, at the Bay of Morozof (Morzhovoi Bay) on the Peninsula of Alaska and at Agattu and Kyska Islands in the westernmost portions of the Aleutian Islands, in accordance with the directions of the U. S. Commissioner of Fisheries; very extensive collections made in the summer of 1899, by an expedition from the University of California, consisting of W. L. Jepson, L. E. Hunt, A. A. Lawson, and W. A. Setchell, with assistance from the Alaska Commercial Company, the Pacific Steam Whaling Company, the Pacific Coast Steamship Company, and Assistant Pratt and officers of the U. S. C. & G. S. Str. Patterson, from the following localities:—St. Michael, Cape Nome, Bay of Unalaska, Delarof Harbor on Unga Island, Karluk, Uyak Bay, St. Paul (the last three on Kadiak Island), Orca, Juneau, and Sitka, Alaska, and Departure Bay, B. C.; a collection gathered for us in 1899, at Delarof Harbor on Unga Island, Alaska, J. B. Downing, Master of the Pacific Steam Whaling Company's Str. Excelsior; a collection obtained through Rev. Albin Johnson, a missionary,

gathered at Yakutat Bay, Alaska in 1899; a collection from Sitka, Alaska, forwarded by Miss Ida M. Rodgers of the Alaska Historical and Ethnological Society in 1889; a few species, collected at Esquimalt in 1898, by W. A. Setchell at an unfavorable tide; many species collected by Miss Josephine E. Tilden at various points in the region of Puget Sound and distributed in her American Algæ (1894–1902); extensive collections at Whidbey Island, Orcas Island, San Juan Island, Seattle, Wash., and other localities in Puget Sound, by N. L. Gardner from 1897 to 1901; a collection from Port Renfrew, B. C., by Miss Eloise Butler and Miss Jessie E. Polley, determined by Frank S. Collins of Malden, Mass., and determinations and some of the specimens communicated to us; a small collection by G. W. Lichtenthaler, made at Port Angeles, Clallam County, Wash., and on Vancouver Island, B. C., determined by Mr. Collins and the names and some of the specimens sent to us; and several fresh water species collected in the vicinity of Seattle by Professors H. R. Foster and T. C. D. Kincaid of the University of Washington. Finally, we have to record that various specimens by some of the collectors mentioned above and some of the specimens collected by DeAlton Saunders on the Alaskan coast have been distributed in Collins, Holden and Setchell, P. B.-A., and these have been examined by us and the references incorporated into our account.

SCOPE.

The aim of the writers of this account, as has been hinted at in the paragraph of the introduction, is to include every alga which is known to them to occur on the coast or in the coast country from the latitude of Cape Flattery northward to the Arctic Ocean. We have included as belonging to the northwestern coast of North America, such islands in the region of Bering Sea as belong to American countries. This has caused us to include the Aleutian Islands, the Pribilof Islands, and St. Lawrence Island. We have enumerated all species belonging to the groups of Cyanophyceæ, Phæophyceæ, Rhodophyceæ, and most of the Chlorophyceæ. We have omitted all account of the Desmidiaceæ and the Diatomaceæ, since our knowledge of these

forms is not sufficient to allow us to include them. The species of the fresh waters and of damp localities removed from the immediate shores, but only within a few miles of the coast line, have been included, because the materials are available and often come into direct connection with the account of the marine species. Much more work needs to be done upon both classes of algæ in this territory and it is our purpose to continue, regarding the present account as tentative and preliminary.

CITATIONS.

In citing, whether it be generic or specific names, localities, or references in the various published writings or published exsiccatæ, we have tried to follow a conservative and, as we hope, an intelligible course. We have followed largely the order and nomenclature of the Engler and Prantl System, departing from it only where it seemed absolutely necessary. In the use of generic names, we have followed usage rather than strict priority, holding that a name which has been recognized for a quarter of a century, or thereabouts, is to be considered fixed and not to be unsettled simply because another may have been proposed earlier, but hitherto neglected for good or even for no real reason. We have preferred to devote our time to the study of the plant itself. In the case of specific names, we have been unwilling to unsettle a name of this rank, which has been long in use, unless the earlier name is so plainly applicable that there can be absolutely no doubt as to the application. Where it has become necessary to unite a series of proposed species, then the earliest name of undoubted application has been chosen and this has also been done in the case of some species, recently proposed but not yet fixed in the literature. We have not attempted to give a list of citations under each species, but have only cited such references as became necessary to indicate what is meant, or to give our authority for mentioning it as occuring in certain localities. The list of localities under each species has been made as full as our knowledge has permitted and in each case, the name of the col-

lector, or of the author recording it as from that locality, has been given, following the usual method of citation in each instance, to agree with the list of authors and their works appended to this account. In case of the collections which are extensive, only the initials of certain collectors have been printed, but these will be plain from the paragraph entitled "Collections". The names of the localities have been given in accordance with the best authority known to us and have been arranged, in general, from north to south. In some cases, however, this has been departed from, but, as we think, without being liable to cause confusion. The specimens cited as having been examined by us, are, with very few exceptions, preserved in our own collections, at present deposited with the Herbarium of the University of California.

ACKNOWLEDGMENTS.

We desire to make acknowledgment of the great assistance we have received from many sources in the prosecution of our work. To all of the collectors, officials, and corporations mentioned in the paragraph on "Collections", we return our sincerest thanks. Without the aid of these, it would have been impossible to accomplish anything whatsoever, in the large task we had set for ourselves, Some several thousand specimens have been provided through the generosity or personal effort of those mentioned, which have enabled us to clear up many points which seemed beyond hope. To Mr. Frank Shipley Collins of Malden, Mass., we are indebted for the determination of nearly all of the Chlorophyceæ and for invaluable assistance at many other points. Through Mr. Collins, we are very much indebted, also, to Dr. Tracy Elliot Hazen, for assistance in determining various Chætophoraceæ and Ulothricaceæ. We desire to thank Professor F. R. Kjellman of Upsala, Sweden, for examinig a set of our Alariæ and returning specimens and notes for our guidance. We feel very grateful to M. Foslie, Esq., of Trondheim, Norway, for similar services in connection with our crustaceous Corallinaceæ. Professor George Davidson, of the University of California, has

been of the greatest help in aiding us in finding the correct geographical names and in fixing doubtful localities. To all of these persons, we return our most sincere thanks.

CYANOPHYCEÆ.

The members of this group are sometimes placed among the algæ, sometimes placed separately in a division with their near relatives the Schizomycetes or Bacteria, which is called Schizophyta. While we believe that this is the proper method of classification, we also feel that the term algæ is only a general one and the recognition that the Cyanophyceæ and Bacteria are phylogenetically distinct from groups, such as the Chlorophyceæ, the Phæophyceæ, etc. does not preclude the extension of the term to them. These groups are also distinct from one another in a similar way, but perhaps less pronouncedly. The greater number of the Cyanophyceæ enumerated as belonging to our territory are not marine, but are largely cosmopolitan fresh water species, able to endure a considerable range of temperature. In studying the marine species of this group, there seems to be a decided falling off, both in the number of species and abundance of individuals, as we proceed to the northward. This does not hold good for the species of the fresh waters. In studying and arranging our forms, we have followed the works of Bornet and Flahault (1886—1889) as regards the heterocysted forms and the monograph of Gomont (1893) for the homocysted forms. The Chroococcaceæ and the Chamæsiphoniaceæ present difficulties hard to overcome. For genera, much help was obtained from Kirchner's arrangement (1898), also considerable assistance as regards species. The specific determinations of these groups, however, will remain very uncertain until some worker follows the example of the French Algologists mentioned above, and gives us a good practical monograph. At present the student must consult the special papers of Nægeli (1849), Meneghini (1846), Kirchner (1878), etc.

FAMILY CHROOCOCCACEÆ.

Chroococcus rufescens (Brebisson) Nægeli.

Forming with Stigonema a reddish coating on a rock five hundred feet above sea level. Prince William Sound, Alaska, *Saunders* (1901, p. 396).

Chroococcus turgidus (Kuetzing) Nægeli.

Among other algæ in pools of fresh water or on dripping rocks. Glacier Valley, Unalaska, Alaska, *A.A.L.*, No. 5023a!; Juneau, Alaska, *Saunders* (1901, p, 396); in brackish water, Whidbey Island, Wash., *N.L.G.*, No. 472!

Glœocapsa ambigua f. **fuscolutea** Nægeli.

Among other algæ, especially *Dichothrix Baueriana* (Grunow) B. & F. and *Schizothrix Braunii* Gomont, in a mountain stream. Orca, Alaska, *W. L. Jepson*, No. 5175!

The cell walls of this form are thick, opaque and reddish or yellowish brown.

Glœocapsa ambigua f. **violacea** Nægeli.

Intermingled with the last.

The only difference between this form and the last is in the color of the cell walls which are distinctly violet and somewhat more opaque.

Glœocapsa atrata Kuetzing.

Intermingled with the last two.

The present species differs from the last two in having the walls transparent and either colorless or else very light blue. They all seem to be forms of one species which is variable in this respect.

Glœocapsa polydermatica Kuetzing.

With other Cyanophyceæ, forming a yellowish firm jelly on dripping rocks. Near Iliuliuk, Unalaska, Alaska *W.A.S. and A.A.L.*, No. 4031!

The specimens referred here have blue green cell contents and colorless stratified walls. The families are one or two-celled. The cells measure 21-22 μ in diameter.

Aphanocapsa Castagnei (Kuetzing) Rabenhorst.

In fresh or sulphur waters. Point Barrow, Alaska, *Farlow* (1885, p. 192); Ravenna Park, Seattle, Wash., *N.L.G.*, No. 400!

Aphanothece stagnina (Sprengel) A. Braun.

Point Barrow, Alaska, *Farlow* (1885, p. 192).

Aphanothece microspora Rabenhorst.

On dripping rocks. Juneau, Alaska, *Saunders* (1901, p. 397).

Aphanothece Castagnei (Brebisson) Rabenhorst.

In a jar of water in the laboratory. University of Washington, Seattle, Wash., *N.L.G.*, No. 590!

The determination is not without some doubt, but the measurements seem to coincide with those given for this species.

Microcystis marginata (Meneghini) Kuetzing.

Forming slimy coatings on dripping rocks. Glacier Valley, Unalaska, Alaska, *A.A.L.*, No. 5023a!; Juneau, Alaska, *Saunders* (1901, p. 397).

The Unalaska specimen seems to belong here although the cells are often twice as long as broad. A consultation of Meneghini's figure (1846, pl, 13, f. 1 and 1a) will show a similar variation. The habit is very strongly of this species.

Gomphosphæria aponina Kuetzing.

Floating intermingled with other algæ in brackish waters. Whidbey Island, Wash., *N.L.G.*, Nos. 296!, 301!, 472!

Oncobyrsa Cesatiana Rabenhorst.

Plentiful on water-moss in running fresh water. Near Iliuliuk, Unalaska, Alaska, *W.A.S. and A.A.L.*, No. 5036!

These plants appeared as small, golden yellow, nearly spherical colonies at a place in the rivulet where the water was most rapidly flowing.

Family CHAMÆSIPHONIACEÆ.

Xenococcus Schousbœi Thuret.

On various filamentous Cyanophyceæ and Chlorophyceæ in

salt and brackish water. Whidbey Island, Wash., *N.L.G.*, Nos. 301!, 670!

The plants examined under No. 670 showed fine conidia.

Pleurocapsa fuliginosa Hauck.

On piles of a wharf. Seattle, Wash., *N.L.G.*, No. 306b!

Dermocarpa fucicola Saunders.

On various algæ. On Iridæa, Victoria, B. C., *Tilden*, Nos. 328a!, 328c!; west shore of Whidbey Island, Wash., *N.L.G.*, 291!; on Gelidium, East Sound, Orcas Island, Wash., *N.L.G.*, No. 522a!; on Gigartina, west shore of Whidbey Island, Wash., *N.L.G.*, No. 77!; on Odonthalia, west shore of Whidbey Island, Wash., *N.L.G.*, No. 92!; on Amphiroa, west shore of Whidbey Island, Wash., *N.L.G.*!; on Fucus, Seattle, Wash, *Saunders* (1901, p. 397) and in Collins, Holden and Setchell, P. B.-A., No. 801!

The present species occurs along the western coast of North America from Puget Sound to Monterey, California, and grows on all sorts of algæ. In its younger and purely vegetative condition, the patches are small and the cells are long and narrow, 4–8 μ broad and up to 28 μ high, of equal breadth throughout. Soon they begin to broaden above, giving them something of a pear-shape. In this condition they correspond closely to the description and figures given by Sauvageau (1895, p. 8, pl. 7, f. 2, 3) of his *D. Biscayensis*.

Sauvageau's specimens, which grew on Sargassum, do not show conidia, but our specimens show that when the cells proceed to this condition, they become still more swollen in the upper part, while the lower part remains narrow, resembling a sort of stipe. In conidial condition the cells measure 60–65 μ in height and 25–35 μ in diameter. While we have used the name *D. fucicola*, we believe that when fruiting specimens can be compared, that this species will be found to be identical with *D. Biscayensis* Sauvageau. Saunders has quoted Sauvageau as claiming a breadth of 25–30 μ for his species, but as a matter of fact that is the height, the breadth being given as 4.5–6 μ. Savageau also speaks of the cells of his species as being broader above than below.

Dermocarpa prasina (Reinsch) Bornet.

Abundant on Sphacelaria. From Puget Sound to the Shumagin Islands, *Saunders* (1901, p. 397).

Chloroglœa tuberculosa (Hansgirg) Wille.

Epiphytic on Cladophora. Port Renfrew, B. C. *Tilden*, No. 382! (under *Pringsheimia scutata* f. *Cladophoræ*).

The plants referred here with some doubt, form irregular, apparently bright green masses on the branches of Cladophora and answer exactly to Wille's description and plate of the habit (1900, p. 2, pl. 1) as well as to those of Hansgirg (1892, p. 240 pl. 1, f. 9). In every respect these plants agree, with the exception that in the specimens distributed by Miss Tilden, there are certain large cells, somewhat irregularly placed, which have the appearance of being young conidangia. There is certainly nothing looking like Pringsheimia in the specimens distributed.

Family OSCILLATORIACEÆ.

Spirulina major Kuetzing.

Pools of slightly brackish water. Monroe's Landing, near Coupeville, Whidbey Island, Wash., *N.L.G.*, No. 411!

Spirulina subsalsa f. Oceanica (Crouan) Gomont.

In mud of pools of brackish water on salt marshes. Whidbey Island, Wash., *N.L.G.*, Nos. 446!, 471!, 615!, and in Collins, Holden and Setchell, P. B.-A., No. 954!

Oscillatoria princeps Vaucher.

In a fresh water pond. Near Seattle, Wash., *Tilden*, No. 296!

Oscillatoria proboscidea Gomont.

In a small pond of fresh water. Glacier Valley, Unalaska, Alaska, *A.A.L.*, No. 5023a!

Oscillatoria sancta Kuetzing.

In a small pond of fresh water. Port Townsend, Wash., *N.G.L.*, No. 444!

Oscillatoria limosa Agardh.

Floating on ditches of slightly brackish water. La Conner, Skagit County, Wash., *N. L. G.*, Nos. 333!, 334!; Whidbey Island, Wash., *N.L.G.*, No. 615!

The determinations given above are not absolutely satisfactory to us.

Oscillatoria Bonnemaisonii Crouan.

In salt marshes. Whidbey Island, Wash., *N.L.G.*, No. 252!

The filaments measure only 12-15 μ which is small for this species. Otherwise, the characters are in agreement with the description.

Oscillatoria nigro-viridis Thwaites.

In salt marshes. Whidbey Island, Wash., *N.L.G.*, No. 615!; Seattle, Wash., Professor *H. R. Foster*, No. 601?

Oscillatoria tenuis var. tergestina (Kuetzing) Rabenhorst.

In pools of fresh or slightly brackish water. Whidbey Island, Wash., *N. L. G.*, Nos. 470!, 596!; Seattle, Wash., *N. L. G.*, No. 396!

Oscillatoria tenuis var. ?

Floating in slightly brackish water in a ditch. La Conner, Skagit County, Wash., *N.L.G.*, No. 333!

Agrees well with *O. tenuis*, except that it is hardly at all torulose.

Oscillatoria amphibia Agardh.

In mud at bottoms of ponds. Whidbey Island, Wash., *N.L.G.*, Nos. 460a!, 470!

Oscillatoria geminata Meneghini.

On mud by the roadside. La Conner, Skagit County, Wash., *N.L.G.*, No. 331!

The determination is not absolutely certain.

Oscillatoria chlorina Kuetzing.

In mud at the bottoms of shallow ponds of fresh water. Whidbey Island, Wash., *N. L. G.*, No. 460!, and in Collins, Holden and Setchell, P. B.-A., No. 901!

Oscillatoria splendida Greville.

On mud in fresh water pools. Seattle, Wash., *N.L.G.*, Nos. 578!, 580!

Oscillatoria splendida f. **uncinata** Setchell and Gardner f. nov. Plate 19.

Agreeing in all respects with the type except that the tip of the filament shows an unusually long, capitate cell which is very markedly uncinate, and the filaments are flexuous and coiled.

On damp mud at the bottom of a pool nearly dried up. Oak Harbor, Whidbey Island, Wash., *N.L.G.*, No. 574!

Oscillatoria amœna (Kuetzing) Gomont.

Lining the bottom of the outlet of a hot spring, temperature 80°–120° F. Sitka, Alaska, *Saunders* (1901, p. 397); on mud in a ditch of fresh water, Seattle, Wash., *N.L.G.*, No. 580!

Oscillatoria lætevirens Crouan.

In a salt marsh. Head of Penn's Cove, Whidbey Island, Wash., *N.L.G.*, No. 471!

The specimen is referred here with some doubt as the filaments are somewhat larger than the measurements given for this species, and the cells are provided with large granules.

Oscillatoria Okeni Agardh.

In pond of brackish water. Monroe's Landing, near Coupeville, Whidbey Island, Wash., *N.L.G.*, No. 596!

Phormidium foveolarum (Montagne) Gomont.

Mixed with *Ph. autumnale* (Agardh) Gomont, in ditches by the roadside. Pleasant Ridge, near La Conner, Skagit County, Wash., *N.L.G.*, No. 331!

The sheaths of this species are diffluent into a very soft jelly much different from that of the species associated with it in this locality.

Phormidium Valderianum (Delponte) Gomont.

On dripping timber of old mill. Sitka, Alaska, *W.A.S. and A.A.L.*, No. 5204!

The Phormidium is intermingled with a sterile Zygnema.

The filaments of the Phormidium are rather slender, measuring 1.5–1.8 μ in diameter.

Phormidium laminosum (Agardh) Gomont.

On dripping rocks or in spring water. Orca, Alaska, *Saunders* (1901, p. 398); San Juan Island, Wash., *N.L.G.*, No. 485!

Phormidium tenue (Meneghini) Gomont.

In various situations, submerged and emergent, in fresh water. Walls of Amaknak Cave, Amaknak Island, Bay of Unalaska, Alaska, *W.A.S. and A.A.L.*, No. 3292!; Coupeville, Whidbey Island, Wash., *N.L.G.*, No. 450!; Oak Harbor, Whidbey Island, Wash., *N.L.G.*, No. 574!; Seattle, Wash., *N.L.G.*, Nos. 593!, 597!

No. 3292 shows the form with the uncinate tip almost entirely.

Phormidium inundatum Kuetzing.

On a dripping water pipe or in watering troughs. Victoria, B. C., *N.L.G.*, No. 319!; Seattle, Wash., *N.L.G.*, No. 393!

Phormidium Corium (Agardh) Gomont.

Mixed with other algæ, particularly of the same family, either submerged or exposed to the air. Cape Nome, Alaska, *W.A.S.!*; Glacier Valley, Unalaska, Alaska, *A.A.L.*, No. 5029c!; near Iliuliuk, Unalaska, Alaska, *W.A.S. and A.A.L.*, No. 5045x!

The specimens referred here are not altogether typical, but seem to belong to this species rather than to any other described.

Phormidium papyraceum (Agardh) Gomont.

At the outlet of a lake. Orcas Island, Wash., *N.L.G.*, No. 613!

Phormidium Retzii (Agardh) Gomont.

Growing on a submerged log. Green Lake, Seattle, Wash., *N.L.G.*, No. 369!

Mixed with the following.

Phormidium ambiguum Gomont.

Growing on a submerged log. Green Lake, Seattle, Wash., *N.L.G.*, No. 369!

Mixed with the preceding.

Phormidium favosum (Bory) Gomont.

Floating or attached to wood in streams or on the ground. Glacier Valley, Unalaska, Alaska, *A.A.L.*, No. 5020c!; Juneau, Alaska, *W.A.S. and A.A.L.*, Nos. 5188x!, 5190x!

No. 5020c represents an unusually slender form, No. 5190x represents a typical form of what Gomont calls var. a, and No. 5188x a typical form of what the same writer calls var. b.

Phormidium Treleasei Gomont.

Mixed with other Cyanophyceæ in a scum on sluggish small streams. Glacier Valley, Unalaska, Alaska, *A.A.L.*, No. 5022c!

This very slender species (0.6–0.8 μ) with elongated cells, has been found hitherto only in thermal waters (Arkansas Hot Springs and Yellowstone National Park), but this specimen seems to belong under it, though of cold waters.

Phormidium uncinatum (Agardh) Gomont.

Forming more or less extended blue-black layers, either submerged or on the surface of the ground. St. Michael, Alaska, *W.A.S.*, No. 5236x!; near Iliuliuk, Unalaska, *W.A.S. and A.A.L.*, No. 5034!; Orca, Alaska, *W.A.S. and A.A.L.*, No. 5172!; LaConner, Skagit County, Wash., *N.L.G.*, No. 331!; Seattle, Wash., *N.L.G.*, Nos. 397!, 400!

This is a very wide-spread species and is frequently so close to the following that it is distinguished with difficulty.

Phormidium autumnale (Agardh) Gomont.

Similar to the last in appearance and habit. Iliuliuk, Unalaska, *W.A.S and A.A.L.*, No. 5034!; Kukak Bay, Alaska, *Saunders* (1901, p. 398); Sitka, Alaska, *W.A.S. and A.A.L.*, No. 5205!; Coupeville, Whidbey Island, Wash., *N.L.G.*, Nos. 450!, 609!; La Conner, Skagit County, Wash., *N.L.G.*, No. 336!; Seattle, Wash., *N.L.G.*, Nos. 394!, 401!, 499!

Lyngbya æstuarii f. limicola Gomont.

On mud in salt marshes. Whidbey Island, Wash., *N.L.G.*, Nos. 451!, 599!, and in Collins, Holden and Setchell, P. B.-A., No. 903!

Lyngbya æstuarii f. natans Gomont.

Floating on pools in salt marshes. West and east shores of Whidbey Island, Wash., *N.L.G.*, Nos. 421!, 571!, 598!, and in Collins, Holden and Setchell, P. B.-A., No. 904!

Lyngbya æstuarii f. ferruginea Gomont.

In pools in salt marshes. Near Coupeville, Whidbey Island, Wash., *N.L.G.*, No. 301!

Intermingled with the next form.

Lyngbya æstuarii f. spectabilis (Thuret) Gomont.

Intermingled with the last.

Lyngbya æstuarii f. æruginosa Gomont.

Floating on pools in salt marshes. Whidbey Island, Wash., *N.L.G.*, Nos. 230!, 429!; Port Townsend, Wash., *N.L.G.*, No. 610!, and in Collins, Holden and Setchell, P. B.-A., No. 902!

Lyngbya semiplena (Agardh) J. Agardh.

Salt marsh. Whidbey Island, Wash., *N.L.G.*, No. 615!

Lyngbya spirulinoides Gomont.

Floating among various filamentous algæ. Lake Washington, Seattle, Wash., *N.L.G.*, No. 493!

Lyngbya ærugineo-cærulea (Kuetzing) Gomont.

Intermingled with other filamentous algæ. Small pond on an island in the Muir Glacier, Alaska, *Saunders* (1901, p. 398); Juneau, Alaska, *Saunders* (1901, p. 398).

Lyngbya versicolor (Wartmann) Gomont.

Floating on a deep pool of fresh water. Glacier Valley, Unalaska, Alaska, *A.A.L.*, No. 5024!

Lyngbya Lagerheimii (Moebius) Gomont.

Among various filamentous algæ. Whidbey Island, Wash., *N.L.G.*, No. 303!; sulphur spring, Ravenna Park, Seattle, Wash., *N.L.G.*, No. 400!

Lyngbya ochracea (Kuetzing) Thuret.

In gelatinous masses on moist bank of creek. Near Port Renfrew, B.C., *Tilden*, No. 588!

Symploca hydnoides var. genuina Gomont.

Growing on logs between tide marks. Whidbey Island, Wash., *N.L.G.*, No. 302!, and in Collins, Holden and Setchell, P. B.-A., No. 905!

Symploca læteviridis Gomont.

On mud-covered rocks near the upper tide limit. St. Michael, Alaska, *W.A.S.*, No. 5248x!

The habit of this plant is slightly Symplocoid and the color light green. The filaments measure 3 μ in diameter, are distinctly torulose, and show a terminal cell either blunt or somewhat pointed. It certainly seems strange to find a plant, hitherto known only from the tropical locality of Key West, so far north, but it is perhaps no greater surprise than finding a plant of distinctly thermal waters, in cold waters.

Symploca muscorum (Agardh) Gomont.

Among mosses on damp ground. Newhall, Orcas Island, Wash., *N.L.G.*, No. 564!

If, as seems to be the case, we are right in referring these specimens to this species, they represent a very slender form, as the trichomes are only 3 μ in diameter.

Plectonema roseolum (Richter) Gomont.

On dripping rocks, intermingled with Rivularia and Hassallia. West shore of Amaknak Island, Bay of Unalaska, Alaska, *W.A.S. and A.A.L.*, No. 4005!

The specimen shows filaments which are only sparingly branched, but with measurements and dotted dissepiments in agreement with No. 191, Phykotheka Universalis. There is no rosy tint perceptible in the composite mass.

Microcoleus chthonoplastes (Flora Danica) Thuret.

On mud in salt marshes. Whidbey Island, Wash., *N.L.G.*, Nos. 299!, 451!, 615!, and in Collins, Holden and Setchell, P. B.-A., No. 906!

Microcoleus tenerrimus Gomont.

In a salt marsh. Whidbey Island, Wash., *N. L. G.*, Nos. 302!, 615!

Microcoleus vaginatus (Vaucher) Gomont.

On damp ground. Glacier Bay, Alaska, *Saunders* (1901, p. 397); La Conner, Skagit County, Wash., *N.L.G.*, No. 335!

The specimen collected by Gardner belongs to Gomont's variety *monticola*.

Schizothrix lacustris A. Braun.

In a pool of fresh water, near Prince William Sound, Alaska, *Saunders*, No. 300! (1901, p. 397).

Schizothrix lardacea (Cesati) Gomont.

Forming bright rose-red tufts on rocks exposed to fresh water spray. Near Iliuliuk, Unalaska, *W.A.S. and A.A.L.*, Nos. 4045!, 5038!, and in Collins, Holden and Setchell, P. B.-A., No. 955!; Orca, Alaska, *Saunders* (1901, p. 396).

Schizothrix rubra (Meneghini) Gomont.

Forming scum on deep pool of fresh water. Glacier Valley, Unalaska, Alaska, *A.A.L.*, No. 5025!

The specimens are preserved in formalin solution and while the filaments agree, little can be made out of the color.

Schizothrix Braunii Gomont.

On dripping rocks. Near Iliuliuk, Unalaska, Alaska, *W.A.S. and A.A.L.*, No. 4032!; Orca, Alaska, *W. L. Jepson*, No. 5175!

Most of the sheaths are colorless, but some are of the characteristic blue-black color of this species. The dissepiments are granular.

Family NOSTOCACEÆ.

Nostoc Linckia (Roth) Bornet.

Floating, intermingled with other algæ, on ponds of fresh water. Near Coupeville, Whidbey Island, Wash., *N.L.G.*, Nos. 462!, 594!

Nostoc rivulare Kuetzing.

Forming floating masses of light brown jelly, in springs and pools. Near Huntville, Unalaska, Alaska, *W.A.S. and A.A.L.*, No. 4095!; near Green Lake, Seattle, Wash., *N.L.G.*, No. 584!

Nostoc carneum Agardh.

Forming brown floating masses of jelly on surface of streams. Glacier Valley, Unalaska, Alaska, *A.A.L.*, Nos. 5020 a and b!, 5026!; Green Lake, Seattle, Wash., *N.L.G.*, No. 587!

Nostoc spongiæforme Agardh.

Floating in a small pool of fresh water. Edge of Green Lake, Seattle, Wash., *N.L.G.*, Nos. 383!, 585!

No. 383, collected in May, 1901, has no spores, but No. 585, collected in the same pool in July, 1901, has an abundance of young spores.

Nostoc muscorum Agardh.

Forming soft gelatinous lumps and masses of various shapes, on rocks among mosses. Amaknak Cave, Amaknak Island, Bay of Unalaska. Alaska, *W.A.S. and A.A.L.*, No. 3295!; near Iliuliuk, Unalaska, Alaska, *W.A.S. and A.A.L.*, No. 4085!; moist ground just above high water mark, Whidbey Island, Wash., *N.L.G.*, No. 422?

The last number is young and shows no spores. No. 394, Tilden, American Algæ, collected at Port Renfrew, B. C., is too scanty for determination, but what there is shows a frond too tough to belong to this species, but which, in consistency at least, approaches the following.

Nostoc commune Vaucher.

Assuming various shapes, from discoid thalli to flat expansions of considerable extent, on soil or on rocks. St. Michael, Alaska, *W.A.S.*, No. 5157y!; Iliuliuk, Unalaska, *W.A.S. and A.A.L.*, No. 4030!; near Hidden Glacier, Yakutat Bay, Alaska, *Saunders* (1901, p, 397); near Glacier Bay, Alaska, *Saunders* (1901, p. 397); Whidbey Island, Wash., *N.L.G.*, Nos. 376!, 611!

Nostoc expansum Harvey and Bailey.

Puget Sound, *Harvey and Bailey* (1851, p. 372), *Bailey and Harvey* (1862, p. 164, pl. 6, f. 1, 2).

This species seems to be unknown, but must be near to, if not identical with the preceding.

Nostoc sphæricum Vaucher.

On dripping rocks among mosses. Amaknak Island, Bay of Unalaska, Alaska, *W.A.S. and A.A.L.*, No. 3291?

The habit and arrangement of the trichomes of this specimen resemble the original description and figures. The trichomes are 5.5-6 μ in diameter, which is large for this species. There are no spores.

Nostoc minutum Desmazieres.

On dripping rocks, much mixed with other algæ of a gelatinous nature. Iliuliuk, Unalaska, Alaska, *W.A.S. and A.A.L.*, No. 4032?

The thalli are minute and spherical. The trichomes are densely intertwined, and measure 3 μ or less. The periderm is firm. There are no spores.

Nostoc microscopicum Carmichael.

Floating, intermingled with other algæ. Whidbey Island, Wash., *N.L.G.*, No. 612?; Seattle, Wash., *N.L.G.*, Nos. 352!, 562!. 581!

Nostoc sphæroides Kuetzing.

Forming a soft bluish green coating on rocks. Juneau, Alaska, *Saunders*, No. 75? (1901, p. 398).

Nostoc cæruleum Lyngbye.

In a ditch of fresh water. Near Seattle, Wash., *N.L.G.*, No. 586?

Seems to belong here, but most of the specimens have passed maturity.

Nostoc pruniforme (L.) Agardh.

In ditches of fresh water. Near Seattle, Wash., *N.L.G.*, Nos. 374!. 375!

Nostoc verrucosum (L.) Vaucher?

Fresh water pools at Port Clarence, Alaska, *Harvey* (1872, p. 463.)

Anabæna variabilis Kuetzing.

In ditches and ponds. Whidbey Island, Wash.,*N.L.G.*, No. 573!; Seattle, Wash., *N.L.G.*, Nos. 588!, 607!

Anabæna sphærica B. & F.

Floating on the surfaces of small ponds. Whidbey Island, Wash., *N.L.G.*,, No. 462!; Port Townsend, Wash., *N.L.G.*, No. 436!

The filaments are agglutinated together in parallel bunches; the spores are very nearly spherical and 10 μ broad; they begin to form near one heterocyst and proceed in their formation, toward the other. In general, the plants noted above come very near to this species, at least.

Anabæna Flos-aquæ (Lyngbye) Brebisson.

Floating on great abundance on quiet water. Lake Union, Seattle, Wash., *N.L.G.*, No. 387!

The filaments are circinate and agree with those of this species in every way, but the plants are all sterile and consequently the determination cannot be absolutely certain.

Anabæna catenula (Kuetzing) B. & F.

Floating on shallow ponds or sluggish streams. Huntville, Unalaska, Alaska, *W.A.S. and A.A.L.*, No. 4095?; Glacier Valley, Unalaska, Alaska, *A.A.L.*, Nos. 5022?, 5028?; near Coupeville, Whidbey Island, Wash., *N.L.G.*, No. 605!; Green Lake, Seattle, Wash., *N.L.G.*, No. 380!

The Unalaska specimens are somewhat doubtful, since they seem to approach too near to the following, but are probably forms of the present with spores adjacent to the heterocysts.

Anabæna oscillarioides Bory.

Floating on pools and lakes, or on moist ground. Coupeville, Whidbey Island, Wash., *N.L.G.*, No. 462!; Seattle, Wash., *N.L.G.*, Nos. 352!, 353!, 372!, and in Collins, Holden and Setchell, P. B.-A., No. 907!; Port Townsend, Wash., *N.L.G.*, No. 436!

No. 436 is a slender form with trichomes not over 4 μ in diameter and with spores not over 30 μ long, perhaps belonging to the var *stenospora*.

Nodularia Harveyana (Thwaites) Thuret.

On mud by the roadside. Near LaConner, Skagit County, Wash., *N.L.G.*, No. 335!

The filaments are 6 μ in diameter, and the spores are 8 μ in diameter.

Nodularia armorica Thuret?

Floating on the surfaces of quiet ponds. Near Coupeville, Whidbey Island, Wash., *N. L. G.*, No. 602!; Port Townsend, Wash., *N.L.G.*, No. 436!

The specimens referred somewhat doubtfully to this species seem intermediate between it and *N. sphærocarpa* B. & F. The filaments are 10 μ in diameter, while the trichomes are 6 μ in diameter. The spores are nearly spherical and show some indications of biconcave dissepiments. They measure, in the riper, but not yet fully mature ones, 9–10 μ by 6–7 μ.

Nodularia spumigena f. major (Kuetzing) B. & F.

In a pond of slightly brackish water. Penn's Cove, near Coupeville, Whidbey Island, Wash., *N.L.G.*, No. 411!

The spores in the number quoted above are scanty and mostly young. Some which are nearly ripe, measure 17–18 μ by 7–8 μ.

Cylindrospermum licheniforme (Bory) Kuetzing.

On mud or moist sand. Near Oak Harbor, Whidbey Island, Wash., *N.L.G.*, No. 600!; near Mt. Vernon, Skagit County, *N.L.G.*, No. 332!; near Seattle, Wash., *N.L.G.*, Nos. 367!, 391!

The specimens quoted above seem to be typical forms of this species. Gardner has collected a specimen (No. 335, LaConner, Skagit County, Wash.,) which also comes very close to it, but the ripe spores are only 15μ by 7 μ.

Cylindrospermum muscicola Kuetzing.

In a small stream of running water. Orcas Island, Wash., *N.L.G.*, No. 474!

The ripe spores are 18 μ by 10 μ and are more oval than oblong.

Cylindrospermum catenatum Ralfs.

Floating in quiet water of a stream. Tracyton, Kitsap County, Wash., *Tilden*, No. 395!

The material in this number is excellent, but it is difficult to find spores in position. They appear to be in chains and answer to the description of those of this species.

Cylindrospermum sp. ?

In a specimen collected floating on a small pond near Coupeville, Whidbey Island, Wash., by Gardner (No. 606), the spores are unripe, but the filaments have heterocysts at both ends. It probably belongs to *C. licheniforme* (Bory) Kuetzing.

Family SCYTONEMATACEÆ.

Microchæte tenera Thuret.

Forming grayish tufts on dripping rocks. Walls of Amaknak Cave, Amaknak Island, Bay of Unalaska, Alaska, *W.A.S. and A.A.L.*, No. 3292!

The heterocysts are chiefly basal, but there are occasional oblong intercalary ones. The general aspect is that of a Calothrix, but it lacks any indication of a terminal hair.

Microchaete robusta Setchell and Gardner sp. nov.

In tufts and stellate clusters on water weeds; filaments elongated and perfectly cylindrical, decumbent at the very base, but scarcely thickened, 16–18 μ in diameter; trichome composed of cells which are quadrate or slightly longer than broad in the lower portion and which are shortened to one-third as long as broad in the upper part, 12 μ in diameter and the cells 6–16 μ long, æruginous and filled with fine granules; sheath thin, at first, but later stratified, hyaline; heterocysts basal and intercalary, the former being spherical or nearly so, while the latter are elongated and rectangular.

In ponds of fresh water. Near Seattle, Wash., Professor *T. C. D. Kincaid*, No. 768!

Apparently a very distinct species. and referred to this genus rather than to Calotrhix, on account of the filaments being of uniform width from base to apex. The terminal cells of the filaments are short and torulose, and the uppermost cells are nearly if not quite colorless, reminding one of the terminal hair of the Rivulariaceæ, but the colorless portion of trichome does not taper at all.

Scytonema varium Kuetzing.

On rocks moistened by spray from a waterfall. Juneau, Alaska, *Saunders*, No. 76! (1901, p. 398.)

Scytonema Hofmanni Agardh.

On dripping rocks. Iliuliuk, Unalaska, Alaska, *W.A.S. and A.A.L.*, No. 4031!

Scytonema mirabile (Dillwyn) Bornet.

On moist ground or in fresh water streams. Kukak Bay and Glacier Bay, Alaska, *Saunders* (1901, p. 398).

This species has not occurred to us, but Saunders has mentioned it under the synonyms, *S. figuratum* and *S. mirabile*. We do not know whether he intended to indicate different species or the same species, but Bornet has demonstrated that the *S. figuratum* Agardh is the same as the *Conferva mirabilis* Dillwyn (cf. Bornet, 1889, p. 12).

Scytonema Myochrous (Dillwyn) Agardh.

Forming small tufts on rocks in a brook. Glacier Bay, Alaska, *Saunders* (1901, p. 398).

Hassallia byssoidea f. saxicola Grunow.

Among mosses on dripping rocks. Amaknak Island, Bay of Unalaska, Alaska, *W.A.S. and A.A.L.*, No. 4005!

Tolypothrix distorta (Fl. Dan.) Kuetzing.

Floating or attached to plants or stones in quiet, fresh waters. Cape Nome, Alaska, *W.A.S.*!; Fidalgo Island, Wash., *N.L.G.*, No. 604!; Lake Washington, Seattle, Wash., *N.L.G.*, Nos. 352!, 570!

Tolypothrix lanata (Desv.) Wartmann.

Forming dark brown, felt-like layers on rocks or on the bottom of shallow fresh waters or dried streams. Iliuliuk, Alaska, *W.A.S. and A.A.L.*, No. 4050!, and in Collins, Holden and Setchell, P. B.-A., No. 956!; near Seattle, Wash., Professor *T. C. D. Kincaid*, No. 766!

All the specimens noted, represent the older stages with deep brown sheaths.

Tolypothrix tenuis Kuetzing.

Forming bluish green tufts in quiet or flowing fresh water. Popof Island, Alaska, *Saunders*, No. 404! (1901, p. 398); Glacier Bay, Alaska, *Saunders*, No. 300! (1901, p. 398); near Newhall, Orcas Island, Wash., *N.L.G.*, No. 616!; Green Lake, Seattle, Wash., *N.L.G.*, No. 562!.

Tolypothrix Setchellii Collins.

On Chara. Near Iliuliuk, Unalaska, Alaska, *A.A.L.*!

A dwarf species.

Tolypothrix limbata Thuret.

Growing on the side of a jar in the botanical laboratory of the University of Washington. Seattle, Wash., *N.L.G.*, No. 500!

The sheath in this specimen is very thick and is ocreate above.

Desmonema Wrangelii (Agardh) B. & F.

On stones in brooks or lakes, or even in pools on the tundra. St. Michael, Alaska, *W.A.S.*, No. 5157x!; near Iliuliuk, Unalaska, *W.A.S. and A.A.L.*, Nos. 4008!, 4044!; Popof Island, Alaska, *Saunders*, No. 404! (1901, p. 398); Glacier Bay, Alaska, *Saunders*, No. 103! (1901, p. 398).

Family STIGONEMATACEÆ.

Hapalosiphon fontinalis (Agardh) Bornet.

In a fresh water pond. Seldovia, Cook Inlet, Alaska, *Saunders* (1901, p. 399, under *H. pumilus*).

Fischerella ambigua (Kuetzing) Gomont.

On vertical rocks, just above the high tide mark. Port Renfrew, B. C., *Tilden*, No. 398!, under *Hassallia byssoidea* f. *cylindrica* Tilden.

Although the basal stratum and fasciculi of branchlets are not well developed, yet the branches seem to indicate this species rather than the one to which Miss Tilden has referred it.

Stigonema ocellatum (Dillwyn) Thuret.

On rocks or floating, in quiet or running fresh water. Near

Prince William Sound, Alaska, *Saunders*, No. 300! (1901, p. 399); Glacier Bay, Alaska, *Saunders* (1901, p. 399).

Stigonema minutum (Agardh) Hassall.

On damp rocks. Prince William Sound, Alaska, *Saunders* (1901, p. 399).

Family RIVULARIACEÆ.

Calothrix consociata (Kuetzing) B. & F.

On grasses, etc., in a salt marsh. Head of Penn's Cove, near Coupeville, Whidbey Island, Wash., *N.L.G.*, No. 548!

From its diameter and coloration of sheath, the number quoted above seems to belong here. The species seems to partake of the characters of both *C. confervicola* (Roth) Agardh and *C. scopulorum* (Weber et Mohr) Agardh, but with much wider sheaths than either species has according to description.

Calothrix scopulorum (Weber et Mohr) Agardh.

In salt water. Puget Sound, *Saunders* (1901, p. 399).

Calothrix pulvinata (Mertens) Agardh.

On sticks and old wood, in salt marshes. Whidbey Island, Wash., *N.L.G.*, Nos. 303!, 560!, and in Collins, Holden and Setchell, P. B.-A, No. 957!

Calothrix crustacea Thuret.

Floating, on rocks, clay banks, wood, etc., in brackish lagoon. Whidbey Island, Wash., *N.L.G.*, Nos. 302!, 421!, 583!; Keyport, Kitsap County, Wash., *N.L.G.*, No. 494!

This is a very variable species, especially concerning the matter of branching. While most of the filaments are simple and typical, there are intermingled, particularly in No. 583, filaments branched in such a way as to properly come under *C. prolifera* Flahault, *C. fasciculata* Agardh, and even *C. vivipara* Harvey. No. 494 grew on a clay bank above high water mark, and represents a very depauperate form of the species.

Calothrix fusca (Kuetzing) B. & F.

Occurring singly or few together in the jelly of other species of algæ. Near Iliuliuk, Unalaska, Alaska, *W.A.S. and A.A.L.*,

No. 4032!; Kadiak Island and Cook Inlet, Alaska, *Saunders* (1901, p. 399).

Calothrix parietina (Nægeli) Thuret.

Forming reddish brown patches on dripping rocks. Amaknak Cave, Amaknak Island, Bay of Unalaska, Alaska, *W.A.S. and A.A.L.*, No. 3294!

Calothrix Braunii B. & F.

On pebbles at edge of lake. Lake Union, Seattle, Wash., *Tilden*, No. 286b!

Miss Tilden has distributed two specimens under this name and number. No. 286a, growing on dead floating stems of Scirpus, has intercalary heterocysts and false branching. It seems to be a species of Tolypothrix. No. 286b seems to represent a form of *C. Braunii* with slender trichomes (4–5 μ in diameter) and sheaths becoming yellowish brown.

Dichothrix Baueriana (Grunow) B. & F.

On dripping rocks or stones in running or quiet water. Near Iliuliuk, Unalaska, Alaska, *W.A.S. and A.A.L.*, No. 4043!; Orca, Alaska, *W. L. Jepson*, Nos. 5173x!, 5175!; Whatcom, Wash., *N.L.G.*, No. 608!

Isactis plana var. fissurata B. & F.

On stones. Captains Bay, Unalaska, Alaska, *A.A.L.*, No. 5013a!

Rivularia Biasolettiana Meneghini.

On dripping rocks, on roots, etc., in fresh or brackish water. West shore of Amaknak Island, Bay of Unalaska. Alaska, *W.A.S. and A.A.L.*, No. 4005!; at mouth of creek, Iliuliuk, Unalaska, Alaska, *W.A.S. and A.A.L.*, No. 4015!; Glacier Bay, Alaska, *Saunders*, No. 102! (1901, p. 399); Juneau, Alaska, *Saunders*, No. 76! (1901, p. 399); Port Renfrew, Vancouver Island, B.C., *Tilden*, Nos. 570!, 571! (the latter under *R. nitida*); East Sound, Orcas Island, Wash., *N.L.G.*, No. 496!

Rivularia nitida Agardh.

On mud near high water mark. St. Michael, Alaska, *W.A.S.* No. 5249x!

Gloiotrichia Pisum Thuret.

On leaves of Potamogeton, in ponds of fresh water. Whidbey Island, Wash., *N.L.G.*, Nos. 459! 463!; near Seattle, Wash., Professor *T. C. D. Kincaid*, No. 767!

The specimens are all young and there are no spores, but there is little doubt as to the determination of the species.

CHLOROPHYCEÆ.

We have used the name Chlorophyceæ, in the broad sense to include all those algæ which have no coloring matter in addition to the chlorophyll. This includes the group of the Conjugatæ, which differs so much from the others in cell structure and in the possession of non-motile gametes that it is generally separated. Similar opinions may be held as to some other families under the Chlorophyceæ, so that it seems best to reserve one term for all the grass-green algæ. In the treatment of this group, we have omitted all reference to the Desmidiaceæ, since from their number and the difficulties of study, they are not usually taken up by the general student. We have, in general, followed the classification proposed and carried out by Wille (1890–1891) in Engler and Prantl, departing from it only in some minor cases. For species, we have used for reference DeToni's account (1889), and such special papers as were particularly concerned in special cases and mentioned in the body of the text.

In the Chlorophyceæ we find that the majority of species are either cosmopolitan, or at least are common to the colder waters of the Northern Hemisphere. We have not constructed a table of species showing comparative distribution, since in the imperfection of our knowledge such a table would be more or less misleading. We find, however, that we know now that it is quite within the bounds of reason to expect to find any species of this group which occurs in the North Atlantic, also in the North Pacific. There are, probably, some species restricted to each district, but we are as yet very uncertain whether those which we now consider to be characteristic of the North Pacific, may not later be found also in the North Atlantic and the reverse.

Although acknowledgment has been made of the very great assistance given us by Mr. F. S. Collins, yet it should be emphasized again that he has made the determinations in the genera Chætomorpha, Cladophora, Enteromorpha, Monostroma, and Urospora, and also scattering determinations in some other genera. He has, beside this, kindly looked over our manuscript and has made corrections and suggestions of great value. In the discussion of the species of Cladophora, a field in which he has gained great proficiency, he has added some notes which will go a long way toward straightening out the confusion hitherto existing. Through him, also, Dr. T. E. Hazen has examined the greater part of our Ulothricaceæ and Chætophoraceæ, and aided us with determinations and critical notes.

Family ZYGNEMACEÆ.

Zygnema chalybeospermum Hansgirg.

In waterfalls in a creek. Port Renfrew, B. C., *Tilden*, No. 392!

Miss Tilden says that the specimens do not agree with this species, but that the smooth median membrane of the zygote and the apparently scalariform conjugation bring it nearer to this than to any other. In our copy of the American Algæ, little is to be determined on account of the poor condition of the specimen distributed.

Spirogyra longata (Vaucher) Kuetzing.

Abundant in ditches of fresh, or even of slightly brackish water. Near LaConner, Wash., *N. L. G.*, No. 340!; Seattle, Wash., *N.L.G.*, Nos. 664!, 665!

Good fruiting material was gathered in May, and both lateral and scalariform conjugation was observed.

Spirogyra porticalis (Mueller) Cleve.

In running water. Popof Island, Alaska, *Saunders* (1901, p. 409).

Spirogyra catenæformis (Hassall) Kuetzing.

In a pond of slightly brackish water. Swantown, Whidbey Island, Wash., *N.L.G.*, No. 417!

This species is mixed with *Spirogyra Grevilleana* in this locality.

Spirogyra varians (Hassall) Kuetzing.

On dripping rocks and in ditches of fresh water. Seldovia, Cook Inlet, Alaska, *Saunders* (1901, p. 409); Whidbey Island, Wash., *N.L.G.*, Nos. 233!, 666!, and in Collins, Holden and Setchell, P. B.-A., No. 962!; East Sound, Orcas Island, Wash., *N.L.G.*, No. 489!; Seattle, Wash., *N.L.G.*, No. 660!

The gatherings of this species show both lateral and scalariform conjugation.

Spirogyra nitida (Dillwyn) Link.

In fresh water. Near Coupeville, Whidbey Island, Wash., *N.L.G.*, No. 661!

Spirogyra majuscula Kuetzing.

In a ditch of fresh water. Near the University of Washington, Seattle, Wash., *N.L.G.*, No. 390!

Our specimens seem to belong to the type, but differ from the ordinary plants in having the fertile cells slightly swollen.

Spirogyra majuscula var. brachymeres Stiz.

On shore of Green Lake, near Seattle, Wash., *Tilden*, No. 285!

Miss Tilden's specimen, in our copy, shows only the preliminary stages of conjugation and leaves the species in doubt.

Spirogyra affinis (Hassall) Petit.

In fresh water stream. Near Iliuliuk, Unalaska, Alaska, *W.A.S. and A.A.L.*, No. 5032!, and in Collins, Holden and Setchell, P. B.-A., No. 959!

Spirogyra Lutetiana Petit.

Floating in a ditch of fresh water. Ravenna Park, Seattle, Wash., *N.L.G.*, No. 402!

Spirogyra dubia var. longiarticulata Kuetzing.

Pond of fresh water. Near Victoria, B. C., *N.L.G.*, No. 316!, and in Collins, Holden and Setchell, P. B.-A., No. 961!

Spirogyra inflata (Vaucher) Rabenhorst.

In a ditch of fresh water. Near Seattle, Wash., *N.L.G.*, Nos. 389!, 659!

Spirogyra Spreeiana Rabenhorst.

Floating in a pond of fresh water. Penn's Cove, Whidbey Island, Wash., *N.L.G.*, No. 629!

Spirogyra Weberi Kuetzing.

Fresh water. Seattle, Wash., *N.L.G.*, No. 663!

The specimens are not quite typical *Spirogyra Weberi*, but are intermediate between that species and *Spirogyra quadrata* (Hassall) Petit.

Spirogyra Grevilleana (Hassall) Kuetzing.

In a pond of slightly brackish water. Swantown, Whidbey Island, Wash., *N.L.G.*, No. 417!

Mixed, in the locality mentioned, with *Spirogyra catenæformis*.

Spirogyra laxa Kuetzing.

In a small pond of fresh water. Whidbey Island, Wash., *N.L.G.*, No. 420!

Family MESOCARPACEÆ.

Mougeotia scalaris Hassall.

In a ditch by the roadside. Orcas Island, Wash., *N.L.G.*, No. 473!

Mougeotia genuflexa (Dillwyn) Agardh.

In pools and ditches of fresh water. Victoria, B. C., *N.L.G.*, No. 314!; Orcas Island, Wash., *N.L.G.*, Nos. 473!, 481!; Seattle, Wash., *N.L.G.*, Nos. 630!, 662!

All the specimens are in good fruit and collected either in May or July. In No. 481, both lateral and scalariform conjugation occurs.

Family VOLVOCACEÆ.

Chlamydomonas sp.

Under this genus are to be placed the several forms, or at least some of them, which were at one time placed under the genus Glœocystis. Here comes then, temporarily, *Gloeocystis Paro-*

liniana (Meneghini) Nægeli which formed soft gelatinous masses of the color of prune jelly on cliffs near Iliuliuk, Unalaska, Alaska (*W.A.S. and A.A.L.*, No. 4032!) and two others, not readily placed, viz., one forming yellow green soft gelatinous patches on mosses at Sitka, Alaska (*W.A.S. and A.A.L.*, No. 5206!) and the other found on a dripping water pipe at Seattle, Wash., (*N.L.G.*, No. 394!).

Sphærella nivalis (Bauer) Sommerfelt.

On banks of snow and where snow is melting. Unalaska, Alaska, *W.A.S. and A.A.L.*, No. 4048!; Yakutat Bay, Alaska, *Saunders* (1901, p. 409).

The so-called red snow is not uncommon in the mountains and even along the shores of the territory included in this paper, but no careful study has been made as to the presence of this species in one or another form. It has seemed best, therefore, to report only these two localities which are represented by actual specimens of the algæ concerned.

Eudorina elegans Ehrenberg.

Mixed with various confervoid species. Bog Lake, west side of Whidbey Island, Wash., *N.L.G.*, No. 456!

Volvox aureus Ehrenberg.

Intermingled with Spirogyra filaments. Near Coupeville, Whidbey Island, Wash., *N.L.G.*, No. 661!

The material of this species was placed in formalin solution and could not be studied in the living condition. The colonies measure about 200 μ in diameter and the cells are 4–6 μ broad. Consequently, the specimens have been referred to this species rather than to *V. globator* (L.) Ehrenberg.

Family TETRASPORACEÆ.

Tetraspora bullosa (Roth) Agardh.

In small ditches of running fresh water. Seattle, Wash., *N.L.G.*, Nos. 381!, 388!

Tetraspora cylindrica (Wahlenb.) Agardh.

In rapidly flowing mountain stream. Silver Bow Basin, Juneau, Alaska, *W. L. Jepson*, Nos. 5200!, 5201!, and in Collins, Holden and Setchell, P. B.-A., No. 908!

Decidedly firmer in texture than the preceding and provided with a distinct stipe, but it hardly seems either necessary or proper to remove it to another genus as Chodat has proposed in creating his Stapfia (1897, p. 947). The possession of a solid gelatinous axis is also a character of the proposed genus Stapfia, but hardly characterizes it sufficiently. Nordstedt (1899, p. 267) has discussed the nature of the genus and the identity of *Stapfia cylindrica* Chodat and *Ulva cylindrica* Wahlenb., while Börgesen (1898, p, 135) has described and figured the stipe.

Tetraspora lubrica var. **lacunosa** Chauv.

In small brooks. Near Iliuliuk, Unalaska, Alaska, *W.A.S. and A.A.L.*, No. 4094!; Port Renfrew, Vancouver Island, B. C., *Butler and Polley*, and in Collins, Holden and Setchell, P. B.-A., No. 861!

Collinsiella Setchell and Gardner gen. nov. Tetrasporacearum.

Fronds globular to irregularly and tuberculately lobed, confluent by a thin basal layer, at first solid, later hollow, composed throughout of pear-shaped cells on dichotomously branched, gelatinous stalks which taper downwards. Chromatophore single, band-shaped, with a single conspicuous pyrenoid.

The genus, here proposed, is most nearly related to Oocardium, but differs from it in the shape of the cells, in the presence of cells throughout the jelly of the frond, and the shape of the gelatinous stalks of the cells. We take pleasure in dedicating this genus to our friend, Frank Shipley Collins of Malden, Mass., in recognition of his services to American Algology.

Collinsiella tuberculata Setchell and Gardner sp. nov. Plate 17.

Forming extended layers of a dark green color and firmly gelatinous consistency on stones and pebbles. Cells piriform, 12–20 μ by 9–12 μ. The branching proceeds from division in two directions at right angles to one another and to the sur-

face of the frond. Only one of these resulting cells divides again, the other remains in position and undivided. From this, it happens that the cells are not all in a peripheral layer as Nægeli (1849, p. 74, pl. III, A.) has described for his *Oocardium stratum*, but are scattered throughout the frond as shown in our figure. The stalks of the cells, also, are different from those of the species just referred to, in that they taper downwards. The stalks take on a deep blue color immediately upon being treated with Chloriodide of Zinc.

On stones and pebbles in a shallow pool, middle litoral zone, in a single locality much exposed to heavy seas, on the west coast of Whidbey Island., Wash., *N.L.G.*, No. 403!, and in Collins, Holden and Setchell, P. B.-A., No. 909! A few specimens of this species have also been collected at the Farallones, near San Francisco, California, by R. A. Harper and W. J. V. Osterhout.

Family PLEUROCOCCACEÆ.

Schizochlamys gelatinosa A. Braun.

Forming light green, lobulated masses at the bottom of a small pond of fresh water. Amaknak Island, Alaska, *W.A.S. and A.A.L.*, No. 5046a!

Oocystis solitaria f. **major** Wille.

On rocks, dripping with fresh water. Near Iliuliuk, Unalaska, Alaska. *W.A.S. and A.A.L.*, No. 4028!

The plant referred to this form of the species measures somewhat less than the dimensions given, but is decidedly larger than the typical form.

Oocystis solitaria f. **crassa** (Wittrock) Hansgirg.

Forming a mucous coating on damp rocks near waterfalls. Juneau, Alaska, *Saunders*, No. 75! (1901, p. 409).

Selenastrum Bibraianum Reinsch.

Among weeds in ponds of fresh water. Near Seattle, Wash., Professor *T. C. D. Kincaid*, No. 768!

There is an abundance of material of this species in the specimen quoted.

Scenedesmus denticulatus var. **linearis** Hansgirg.

Mixed with other algæ in a pond of slightly brackish water. Near Swantown, Whidbey Island, Wash., *N.L.G.*, No. 417!

Urococcus insignis Hassall.

Intermixed with other algæ on sods of deserted hut, Cape Nome, Alaska, *W.A.S.*!; intermixed with other algæ on dripping rocks, Esquimalt, B. C., *N.L.G.*, No. 327!

All stages of this interesting but puzzling organism were found in the collections, from thin-walled cells with green contents, to very thick-walled cells with golden yellow contents.

Family PROTOCOCCACEÆ.

Chlorochytrium inclusum Kjellman.

Endophytic in the fronds of various membranaceous red algæ. In the fronds of *Iridæa laminarioides* Bory, Unga, Alaska, *A.A.L.*, No. 5050!; west coast of Whidbey Island, Wash., *N.L.G.*, No. 290!; in the fronds of *Callymenia Phyllophora* J. Agardh, Harvester Island, Uyak Bay, Kadiak Island, *W.A.S. and A.A.L.*, No. 5119!; Unga, Alaska, *A.A.L.*, No. 5055!; in the fronds of *Constantinea Sitchensis* P. & R., Esquimalt, B. C., *Tilden*, No. 389!; in the fronds of *Sarcophyllis Californica* J. Agardh, *N.L.G.*, in Collins, Holden and Setchell, P. B.-A., No. 514!

This plant is probably very common and careful examination will probably show it endophytic on other species of red algæ from other localities, but enough is recorded to give reason for believing that it is by no means uncommon in the region under discussion. It extends down to Monterey on the coast of California and perhaps even farther southward. The form growing on Constantinea has been investigated and reported upon by E. M. Freeman (1899) who decides that it is a true Chlorochytrium and very probably *Ch. inclusum* Kjellman.

Chlorochytrium Schmitzii Rosenvinge.

In fronds of *Petrocelis Middendorfii* (Ruprecht) Kjellman, growing in the upper litoral zone. Harvester Island, Uyak Bay,

Kadiak Island, Alaska, *W.A.S. and A.A.L.*, No. 5124!; lower litoral zone, west coast of Whidbey Island, Wash., *N.L.G.*!

The plants referred under this species agree very well with the description and figure of Rosenvinge, except that some have apical papillæ. Some of them do not have these and agree in this with the original description.

FAMILY HYDRODICTYACEÆ.

Pediastrum Boryanum (Turpin) Meneghini.

Intermixed with other algæ of fresh water pools. Point Barrow, Alaska, *Farlow* (1885, p. 192); Popof Island, Alaska, *Saunders*, (1901, p. 409).

Pediastrum angulosum (Ehrenberg) Meneghini.

Intermixed with other algæ in shallow pools and ponds of fresh water. Glacier Valley, Island of Unalaska, Alaska, *A.A.L.*, No. 5023a!; Popof Island, Alaska, *Saunders* (1901, p. 409).

Sorastrum spinulosum Nægeli.

Among water weeds in ponds of fresh water. Near Seattle, Wash., Professor *T. C. D. Kincaid*, No. 768!

Very scanty, but of undoubted occurrence in the specimen quoted.

FAMILY ULVACEÆ.

Monostroma lubricum Kjellman.

Sitka, Alaska, *Ida M. Rodgers*, No. 5722!

Monostroma latissimum (Kuetzing) Wittrock.

On stones and mussels, lower litoral zone, in more or less brackish water. Iliuliuk, Unalaska, Alaska, *W.A.S. and A.A.L.*, No.4020!; on Fucus, litoral zone, Uyak Bay, Kadiak Island, Alaska, *W.A.S. and A.A.L.*, No. 5077! (a younger form); in brackish pools, near LaConner, Skagit County, Wash., *N.L.G.*, No. 567!

Monostroma quaternarium (Kuetzing) Desmazieres.

West coast of Whidbey Island, Wash., *N.L.G.*, No. 187!

Monostroma Grevillei (Thuret) Wittrock.

On stones, just above and just below extreme low water mark. Iliuliuk, Unalaska, Alaska, *W.A.S. and A.A.L.*, No. 4016a!

Mr. Collins in his report on the collections says "*Monostroma Grevillei*, probably". The species is also taken in a sense somewhat narrower than that of Rosenvinge (1893, p. 948, *et seq.*), at least not including *M. arcticum* nor *M. Vahlii* (cf. also Rosenvinge, 1894, pp. 149–155, and 1898, p. 117.)

Monostroma arcticum Wittrock.

On stones in shallow pools of the middle litoral zone. West shore of Amaknak Island, Bay of Unalaska, Alaska, *W.A.S. and A.A.L.*, No. 3260!, and in Collins, Holden and Setchell, P. B.-A., No. 910!; Karluk, Kadiak Island, Alaska, *W.A.S.*, No. 5071!

Mr. Collins takes *M. arcticum* in a sense broad enough to include *M. angicavum* Kjellman and *M. saccodeum* Kjellman, but prefers to keep *M. arcticum*, itself, as a distinct species, and not unite it with *M. Grevillei* Wittrock as Rosenvinge has done (cf. Rosenvinge, 1893, p. 946, and 1894, p. 152).

Monstroma Grœnlandicum J. Agardh.

On small boulders, middle litoral zone. West shore of Amaknak Island, Bay of Unalaska, Alaska, *W.A.S. and A.A.L.*, Nos. 3278!, 3299!; Kukak Bay, Alaska, *Saunders* (1901, p. 410).

Monostroma Vahlii J. Agardh.

Kukak Bay, Alaska, *Saunders* (1901, p. 410).

Monostroma fuscum (P. & R.) Wittrock.

On stones in the middle litoral zone. North Pacific Ocean, *Postels and Ruprecht* (1840, p. 21, under *Ulva fusca*); Kukak Bay and Virgin Bay, Alaska, *Saunders* (1901, p. 409); Orca, Alaska, *W.A.S. and A.A.L.*, No. 5159!; Muir Inlet of Glacier Bay and Sitka, Alaska, *Saunders*, (1901, p. 409); floating in slightly brackish water, Crocket's Lake, Whidbey Island, Wash., *N.L.G.*, No. 531!

Mr. Collins takes this species in the later and broader sense to include also *M. splendens* (Ruprecht) Wittrock and *M. Blyttii* (Areschoug) Wittrock. All the above specimens which have

been examined belong to Rosenvinge's var. *typica*. No. 531 is the form known as *M. Blyttii*.

Monostroma fuscum var. **splendens** (Ruprecht) Rosenvinge.

On stones in the middle litoral zone. St. Paul Island, Alaska, *Townsend*, No. 5785!, *Greeley and Snodgrass*, No. 5800! (cf. Setchell, 1899, under *M. splendens*); west shore of Amaknak Island, Bay of Unalaska, Alaska, *W.A.S. and A.A.L.*, No. 3261!, and in Collins, Holden and Setchell, P. B.-A., No. 911!; Pinnacles, near Summer Bay, Unalaska, Alaska, *A.A.L.*, No. 4097!; Lowe Inlet, Alaska, *Saunders* (1901, p. 409, under *M. splendens*). The variety, which is the original *Ulva* or *Ulvaria splendens* Ruprecht, is to be distinguished from the var. *typica*, according to Rosenvinge, by the thickened external wall.

Monostroma leptodermum Kjellman.

Forming a dense growth on Zostera, in shallow water. Between Brown and San Juan Islands, Wash., *Tilden*, No. 388!, under *Monostroma zostericolum*.

Mr. Collins reports that this is the same plant as found growing on the New England coast and listed by him (1900, p. 44), and that it agrees in all respects with the description and figures of Kjellman (1877, p. 52, fig. 23, 24). Rosenvinge (1893, p. 944 and 1894, p. 149), however, figures a plant under Kjellman's name which has a long tubular stipe which is lacking in the New England specimens, and also in the specimens of Miss Tilden. Kjellman's plants lacked the base. The question is, whether the plant of Rosenvinge or our plant is the plant of Kjellman. Mr. Collins prefers to believe that our plants are *M. leptodermum* and that Rosenvinge's belong to another and probably to a new species.

Ulva Lactuca var. **rigida** (Agardh) LeJolis.

In various situations. St. Lawrence Island, Alaska, *Kjellman* (1889, p. 53, under *U. rigida*); Pathfinder Rock, Norton Sound, Alaska, *R. C. McGregor*, No. 5680!; St. Michael, Alaska, *W.A.S.*, No. 5237x!, 5245y!; Shumagin Islands, Alaska, *Saunders* (1901, p. 410); Harvester Island, Uyak Bay, Alaska, *W.A.S. and A.A.L.*, No. 5116!; Virgin Bay, Prince William

Sound, Alaska, *Saunders* (1901, p. 410); Sitka, Alaska, *Ida M. Rodgers*, No. 5723!; Port Renfrew, B. C., *Butler and Polley*, No. 14; Esquimalt, B. C., *Harvey* (1862, p. 176); Idlewild, San Juan Island, Wash., *Tilden*, Nos. 386!, 387!; Tracyton, Kitsap County, Wash., *Tilden*, No. 260!

Ulva Lactuca var. **latissima** (L.) LeJolis.

Generally floating when mature, but in the earlier stages attached to rock or wood, usually in muddy situations. Pinnacles, Summer Bay, Unalaska, Alaska, *A.A.L.*, No. 4097a!; Sitka, Alaska, *Saunders* (1901, p. 410, under *U. Lactuca myriotrema*); Norfolk Sound (near Sitka), Alaska, *Postels and Ruprecht* (1840, p. 21); Puget Sound, *Bailey and Harvey*, (1862, p. 163); Esquimalt, B. C., *Harvey*, (1862, p. 176); Whidbey Island, Wash., *N.L.G.*, No. 112!; East Sound, Orcas Island, Wash., *N.L.G.*, No. 529!; Friday Harbor and Roach Harbor, San Juan Island, Wash., *N.L.G.*, No. 667!

It is difficult to determine just what course to take with the various specimens of Ulva which we have from the region included under this account. A very considerable study of the species of Ulva along the entire western coast of North America indicates that, while there may be many forms, there is probably only one species and very few varieties. The habit, size, color, and even the character of cell depends so much on the age and the environment of the specimen, that it is possible to trace a series from the quiet water inside a point of land to the exposed localities outside of it which may include all the forms and intermediate conditions between the most distinct species as yet proposed under the genus. We have, therefore, arranged the forms of the Northwest Coast under two varieties of one species. Var. *rigida* includes all the specimens which are lanceolate in general outline, while var. *latissima* includes all those which show a tendency to be shorter than broad, and are of general expanded habit at maturity. Under each of these varieties, there are numerous forms to be mentioned, due to less conspicuous conditions of growth, but we have decided not to attempt a separation of these in this paper. Nos. 260 and 387 of Miss Tilden's American Algæ are conspicuous on account of the long stipes which give them the appearance

of *Enteromorpha Linza*. No. 667 of N. L. Gardner covered the quiet bays, lying on the muddy bottom, or floating in expanded fronds two or three meters square. Young plants were found just starting on the warm mud. In using the names of Le Jolis, the writers desire to have it understood that they do not accept all of the synonymy of that writer. The *Ulva fasciata* of Harvey's List (1862, p. 176) is unknown to us, but we presume that it is only a narrow form of var. *rigida*.

Enteromorpha micrococca Kuetzing.

On rocks, upper or middle litoral zone. Bay of Unalaska, Alaska, *W.A.S. and A.A.L.*, No. 4054a!; Dutch Harbor, Amaknak Island, Bay of Unalaska, Alaska, *R. C. McGregor*, No. 5695!; Shumagin Islands and Orca, Alaska, *Saunders* (1901, p. 411).

Enteromorpha micrococca f. subsalsa Kjellman.

On dripping rocks above high water mark. Chuckanut Quarry, near Fairhaven, Wash., *N.L.G.*, No. 228!

Enteromorpha fascia P. & R.

In the North Pacific Ocean between Asia and America, *Postels and Ruprecht* (1840, p. 21).

We know nothing of this species beyond the information in Postels and Ruprecht just cited, and such additional facts as are presented by J. G. Agardh in his revision of the Ulvaceæ (1882, p. 125) where the opinion is expressed that it is very near to *E. compressa* (L.) Grev., but differs from that species in having a light brown color. Mr. Collins reports that he has examined the specimen labelled *Enteromorpha fascia*, under No. 1052 of Wittrock and Nordstedt, and finds it different from any species of the genus which he has seen before.

Enteromorpha prolifera (Mueller) J. Agardh.

Usually found floating or cast ashore. Golofnin Bay, Alaska, *R. C. McGregor*, No. 5687!; Juneau, Alaska, *W.A.S. and A.A.L.*, No. 5195!; Annette Island, Alaska, *Saunders* (1901, p. 411); near Coupeville, Whidbey Island, Wash., *N.L.G.*, No. 210!, and in Collins, Holden and Setchell, P. B.-A., No. 913!; Tracyton, Kitsap County, Wash., *Tilden*, Nos. 385!, 264! (under *E. com-*

pressa var. *subsimplex*), 265! (under *E. compressa* var. *complanata*).

Enteromorpha intestinalis (L.) Link.

In all sorts of localities in the upper litoral zone and in the brackish waters of mud flats and ditches in salt marshes. Metlakatla, Annette Island, Alaska, *Saunders* (1901, p. 411); Straits of Georgia, *Harvey* (1862, p. 176); Port Renfrew, B. C., *Butler and Polley*, Nos. 29, 42; Whidbey Island, Wash., *N. L. G.*, Nos. 167!, 229!, 518!, 519!, 532!; East Sound, Orcas Island, Wash., *N.L.G.*, No. 568!

This usually very common and somewhat variable species was not detected in the upper portions of our territory, although many localities seemed favorable for its growth. There has been no attempt to segregate the numbers given above into forms. Three forms have been separated, however, by others and are quoted below.

Enteromorpha intestinalis f. genuina Hauck.

On the beach at Tracyton, Kitsap County, Wash., *Tilden*, No. 263!

Mr. Collins notes (in lit.) that this plant is not exactly like No. 323 of the Phykotheka Universalis, but is fairly near it.

Enteromorpha intestinalis f. cylindracea J. Agardh.

Saunders notes this form (1901, p. 411) from Sand Point, Popof Island, and from Kukak Bay, Alaska.

Enteromorpha intestinalis f. maxima J. Agardh.

Saunders notes this form (1901, p. 411) from Kukak Bay and Orca in Alaska and from Victoria, B. C.

Enteromorpha Linza (L.) J. Agardh.

Attached to stones in the litoral zone. North Pacific Ocean, *Postels and Ruprecht* (1840, p. 21); Esquimalt, B. C., and Orcas Island, Wash., *Harvey* (1862, p. 176); Victoria, B. C., *Tilden*, No. 384!; Friday Harbor, San Juan Island, Wash., *N.L.G.*, Nos. 168!, 213!

Enteromorpha Linza f. lanceolata J. Agardh.

Similar places. Orca, Alaska, *W.A.S. and A.A.L.*, No. 5161!; Yakutat Bay, Alaska, *Saunders* (1901, p. 411), *Rev. Albin Johnson*, No. 5702!, and in Collins, Holden and Setchell, P. B.-A., No. 967b!; Whidbey Island, Wash., *N.L.G.*!

Some, if not all, of the numbers given under the species are of this form, while of the second form only one reference is known to us as given below.

Enteromorpha Linza f. crispata J. Agardh.

Sitka, Alaska, *Saunders* (1901, p. 411).

Enteromorpha minima Nægeli.

Forming yellowish green silky tufts and patches in the upper and middle litoral zones. West shore of Amaknak Island, Unalaska Bay, Alaska, *W.A.S. and A.A.L.*, No. 3280!; Iliuliuk, Unalaska, Alaska, *W.A.S. and A.A.L.*, No. 4041!; Uyak Bay, Kadiak Island, Alaska, *W.A.S. and A.A.L.*, No. 5097!; Orca, Alaska, *W.A.S. and A.A.L.*, No. 5197!; Port Renfrew, B. C., *Butler and Polley*!; San Juan Island, Wash., *N.L.G.*, No. 217!, and in Collins, Holden and Setchell, P. B.-A., No. 912!

Enteromorpha minima f. rivularis Collins.

In running fresh water of Iliuliuk Creek, forming elongated, yellow, much entangled masses. Iliuliuk, Unalaska, Alaska, *W.A.S. and A.A.L.*, No. 5043!, and in Collins, Holden and Setchell, P. B.-A., No. XXVI!

"From typical *E. minima* Naeg., distributed as P. B.-A., No. 468b, this form differs by the lighter color, greater length of filaments, more gelatinous substance, and by its occurrence in fresh water." Collins, P. B.-A., 1901c, No. XXVI.

Enteromorpha compressa (L.) Greville.

On rocks, stones, and other algæ, mostly in the upper and middle litoral zones. Golofnin Bay, Alaska, *R. C. McGregor*, Nos. 5666! and 5667!; Pathfinder Rock, Norton Sound, Alaska, *R. C. McGregor*, No. 5685!; Besboro Island, Norton Sound, Alaska, *R. C. McGregor*, Nos. 5663!, 5682!; St. Michael, Alaska, *W.A.S.*, Nos. 5240x!, 5250x!; North Pacific Ocean, *Postels and Ruprecht* (1840, p. 21); Bay of Unalaska, Alaska, *W.A.S. and*

A.A.L., No. 4063!; Harvester Island, Uyak Bay, Kadiak Island, Alaska, *W.A.S. and A.A.L.*, No. 5107!; St. Paul, Kadiak Island, Alaska, *W.A.S. and A.A.L.*, No. 5139!; Yakutat Bay, Alaska, *Rev. Albin Johnson*, No. 5713!; Juneau, Alaska, *W.A.S. and A.A.L.*, Nos. 5187!, 5193!; Esquimalt, B. C., *Harvey* (1862, p. 176); Puget Sound, *Bailey and Harvey* (1862, p. 163); Snakalum Point, Whidbey Island, Wash., *N.L.G.*, No. 197!

Enteromorpha compressa f. racemosa *a* Ahlneri Kjellman.
Enteromorpha compressa f. racemosa *b* abbreviata Kjellman.

St. Lawrence Island and Port Clarence, Alaska, *Kjellman* (1889, p. 52).

Enteromorpha crinita (Roth) J. Agardh.

Attached to rocks or floating, in muddy places. St. Michael, Alaska, *W.A.S.*, No. 5250x!; Prince William Sound, Alaska, *Saunders* (1901, p. 412); Valdes, Alaska, *W.A.S. and A.A.L.*, Nos. 5184!, 5185!; Sitka, Alaska, *Saunders* (1901, p. 412), *W.A.S. and A.A.L.*, Nos. 5203a!, 5207a!, and in Collins, Holden and Setchell, P. B.-A., No. 965!; Wrangell, Alaska, *Saunders* (1901, p. 412.)

Mr. Collins notes that No. 5203a is too near to *E. erecta* (Lyngbye) J. Agardh.

Enteromorpha percursa (Agardh) J. Agardh.

In brackish pools and in salt marshes, usually entangled with other filamentous Chlorophyceæ. Amaknak Island, Bay of Unalaska, Alaska, *W.A.S. and A.A.L.*, No. 4003!, and in Collins, Holden and Setchell, P. B.-A, No. 968!; Whidbey Island, Wash., *N.L.G.*, Nos. 301!, 414!, 415!

Enteromorpha aureola (Agardh) Kuetzing.

On rocks covered with slight layer of mud. St. Michael, Alaska, *W.A.S.*, No. 5241x!

The plant referred here, is mixed with *Rhizoclonium riparium* var. *implexum*.

Prasiola crispa (Lightfoot) Agardh.

On turf of old barrabbas, on tussocks in the tundra, on damp ground, etc. Cape Nome, Alaska, *W.A.S*!; St. Michael, Alaska,

L. M. Turner, No. 849 (Herb. U. S. National Museum)!, *W.A.S.*, Nos. 5235!, 5243x!, and in Collins, Holden and Setchell, P. B.-A., No. 969!, under *Hormidium parietinum*; St. Paul Island, Alaska, *B. W. Everman*! (Setchell, 1889, p. 590); Iliuliuk, Unalaska, Alaska, *W.A.S. and A.A.L.*, No. 4010!; St. Paul, Kadiak Island, Alaska, *W.A.S. and A.A.L.*, No. 5137!, *Saunders* (1901, p. 412, under *Hormidium parietinum*); Orca, Alaska, *W.A.S. and A.A.L.*, Nos. 5182!, 5183!; Yakutat Bay, Alaska, *Saunders* (1901, p. 412); Juneau, Alaska, *W.A.S. and A.A.L.*, Nos. 5191!, 5192!; Departure Bay, Vancouver Island, B. C., *W.A.S. and A.A.L.*, No. 5211!; Coupeville, Whidbey Island, Wash., *N.L.G.*, 669!

The specimens quoted above include all sorts of conditions from the typical *P. crispa* with its broad flat frond, to filamentous forms referable to *Hormidium parietinum* (Vaucher) Kuetzing or even to *H. murale* (Lyngbye) Kuetzing. In the majority of cases, these forms are mixed in the same collection and often show more or less perfect transitions from the one to the other.

Prasiola calophylla (Carmichael) Meneghini.

In brackish water at the head of Penn's Cove, Whidbey Island, Wash., *N.L.G.*, No. 258!

This narrow species contrasts very decidedly with *P. crispa* as well as with the next two species in the shape of the frond and the arrangement of the cells. We have been unable to compare it with authentic specimens but it answers to the descriptions and the figures so exactly that we feel little doubt concerning it.

Prasiola borealis Reed.

On rocks, just above high water mark. Iliuliuk, Unalaska, Alaska, *W.A.S. and A.A.L.*, Nos. 4013!, 4021!; St. Paul, Kadiak Island, Alaska, *W.A.S. and A.A.L.*, No. 5138!

This species comes nearest to *P. Antarctica* Kuetzing, but differs from it in shape and color of the fronds and in the less regular tetrad arrangement of the cells. The specimens of *P. borealis* are infested with a fungus (*Guignardia Alaskana* Reed) just as the Antarctic species is with *Guignardia Prasiolæ* (Winter) Reed, which gave rise to the genera *Mastodia* Hooker and Harvey and *Dermatomeris* Reinsch. For further details

consult Miss Reed's paper on the subject (Univ. of Calif. Publications, Botany, Vol. 1).

Prasiola fluviatilis (Sommerfelt) Areschoug.

Point Barrow, Alaska, *Farlow* (1885, p. 192)!

This is what Farlow refers doubtfully to *P. crispa* in the reference cited above. A specimen from Herb. Farlow in the U. S. National Herbarium is labelled *P. crispa* f. *maxima*?, but a specimen sent to us from Herb. Farlow, labelled as above, seems to us properly referred.

Family ULOTHRICHACEÆ.

Ulothrix subtilis Kuetzing.

In slightly brackish water, Victoria, B. C., *N.L.G.*, No. 338!; in fresh water, LaConner, Skagit County, Wash., *N.L.G.*, No. 315!

The determination of these specimens is not absolutely certain, but they seem to belong to the typical form (f. *genuina* Kirchner) of this species.

Ulothrix zonata (Weber et Mohr) Kuetzing.

Forming yellowish green, almost gelatinous patches on rocks wet with abundant spray. Cascade near Iliuliuk, Unalaska, Alaska, *W.A.S. and A.A.L.*, No. 4046!, 5033!

The plants listed under this species were most beautiful in their growth and came from the very same spot, the earlier number having been collected on June 30, 1899, and the later number on August 10, 1889.

The determination was made by T. E. Hazen through the kindness of Mr. Collins.

Ulothrix tenuis Kuetzing.

Among the roots and leaves of grasses, slightly inundated, side of a rill. Near Iliuliuk, Unalaska, *W.A.S. and A.A.L.*, No. 5012a!

Determined by T. E. Hazen, through the kindness of Mr. Collins.

Ulothrix implexa Kuetzing.

Forming more or less expanded layers in localities near the mouths of small streams where the water is brackish, or, at times, nearly fresh. On piles of a wharf, Iliuliuk, Unalaska, Alaska, *W.A.S. and A.A.L.*, No. 4017!; on Fucus, Orca, Alaska, *W.A.S. and A.A.L.*, No. 5180!

Determined by T. E. Hazen, through the kindness of Mr. Collins.

Ulothrix flacca (Engl. Bot.) Thuret.

On rocks, pebbles, old wood, etc. St. Michael, Alaska, *W.A.S.*, No. 5251x!; Glacier Bay, *Saunders*, (1901, p. 412); Fairhaven, Wash., *N.L.G.*, No. 194!

The determinations are all by Mr. Collins.

Gayella polyrhiza Rosenvinge.

On small boulders, well up in the litoral zone. West shore of Amaknak Island, Bay of Unalaska, Alaska, *W.A.S. and A.A.L.*, No. 3279a!, and in Collins, Holden and Setchell, P. B.-A., 914!

This seems to be the only locality for this species discovered outside of those on the west coast of Greenland and the Færöes. Börgesen (1902, p. 482) refers this species to *Prasiola crispa* as subsp. *marina*. (det. F. S. Collins.)

Hormidium sp.

Species formerly referred to this genus, especially *H. parietinum* (Vaucher) Kuetzing, have been found either pure or associated with Prasiola-forms in different stages of development. We have referred them all under Prasiola.

Microspora floccosa (Vaucher) Thuret.

In pools above high water mark, Esquimalt, B. C., *Harvey* (1862, p. 177, under *Conferva floccosa*); in creek, Port Renfrew, B. C., *Tilden*, No. 139b!

Conferva bombycina (Agardh) Lagerheim.

Forming silky, yellow, gelatinous masses on dripping rocks. Amaknak Cave on the west shore of Amaknak Island, Alaska,

W.A.S. and A.A.L., No. 3297! (det. T. E. Hazen); on dripping rock cliff, Esquimault, B. C., *N.L.G.*, No. 327! (probably f. *genuina*).

"Conferva rivularis Ag."

Sumas Prairie, B. C., *Harvey* (1862, p. 177).

We have no knowledge or suspicion as to the identity of this plant.

Family CHÆTOPHORACEÆ.

Stigeoclonium lubricum (Dillwyn) Kuetzing.

In light yellow tufts on grasses, in a small, slow stream in the tundra above the lake. Near Iliuliuk, Unalaska, Alaska, *W.A.S. and A.A.L.*, No. 5035! (det. T. E. Hazen).

Draparnaldia glomerata (Vaucher) Agardh.

In small brook, Huntville, Island of Unalaska, Alaska, *W.A.S. and A.A.L.*, No. 4094!; on damp rocks above tide, Ludlow Bay, Jefferson County, Wash., *N.L.G.*, No. 554!

Draparnaldia glomerata var. genuina Kirchner.

In cold water stream. Hazeldene Creek, Port Renfrew, Vancouver Island, B. C., *Tilden*, No. 383!

Draparnaldia plumosa (Vaucher) Agardh.

Growing on pebbles along the shore of Green Lake, Seattle, Wash., *N.L.G.*, No. 498! (det. T. E. Hazen).

Chætophora pisiformis (Roth) Agardh.

Attached to weeds, grass, dead stems, sticks, etc., in springs and pools of fresh water. Near Coupeville, Whidbey Island, Wash., *N.L.G.*, No. 461!; Green Lake, Seattle, Wash., *N.L.G.*, No. 478!; Seattle, Wash., *N.L.G.*, No. 386!

Chætophora elegans (Roth) Agardh.

In ponds of fresh water. Near Coupeville, Whidbey Island, Wash., *N.L.G.*, No. 461!; Port Townsend, Wash., *N.L.G.*, No. 434!

Chætophora Cornu-Damæ var. genuina De Toni.

On sticks, sedges, and grasses, in pool of fresh water. East Sound, Orcas Island, Wash., *N.L.G.*, Nos. 484!, 497!

Chætophora Cornu-Damæ var. linearis Kuetzing.

South end of Lake Washington, near Renton, King County, Wash., *Tilden*, No. 267!

Ochlochæte Hystrix Thwaites.

On water weeds in ponds of fresh water. Near Seattle, Wash., Professor *T. C. D. Kincaid*, No. 768!

Trentepohlia Iolithus (L.) Wallroth.

On rocks at 1000 feet elevation. Orca, Alaska, *Saunders* (1901, p. 413).

Family MYCOIDEACEÆ.

Pringsheimia scutata f. Cladophoræ Tilden.

On Cladophora, in tide pool. Port Renfrew, B. C., *Tilden*, No. 382!

We have examined the specimen distributed by Miss Tilden in our copy of the American Algae and find an epiphyte which, while bearing a certain superficial resemblance to *Pringsheimia scutata* Reinke, structurally shows itself clearly a member of the Chamæsiphoniaceæ and probably identical with Wille's *Chlorogloea tuberculosa*, under which name it has been mentioned in its proper sequence in this account. We feel that Miss Tilden's name is fairly properly to be placed as a synonym under Wille's.

Family ŒDOGONIACEÆ.

We have found no species of this family, ourselves, and can only quote those enumerated by Miss Tilden and by Saunders, the determinations of all of which are by Karl E. Hirn.

Œdogonium concatenatum (Hassall) Wittrock.

Popof Island, Alaska, *Saunders* (1901, p. 412).

Œdogonium crispum (Hassall) Wittrock.

In pools, on rocks, just above high water mark. Port Renfrew, B. C, *Tilden*, No. 543!

Bulbochæte Brebissonii Kuetzing.

In a fresh water pond. Near Seldovia, Cook Inlet, Alaska, *Saunders* (1901, p. 412).

Bulbochæte intermedia De Bary.

In a fresh water pond. Seldovia, Cook Inlet, Alaska, *Saunders* (1901, p. 412).

Bulbochæte Nordstedtii Wittrock.

In a fresh water pond. Seldovia, Cook Inlet, Alaska, *Saunders* (1901, p. 413).

Bulbochæte nana Wittrock.

In a fresh water pond. Shumagin Islands, Alaska, *Saunders* (1901, p. 413).

Bulbochæte insignis Pringsheim.

Saunders (1901, p, 413) gives this species in his Alaskan Algæ, but does not mention any special locality.

Family COLEOCHÆTACEÆ.

Coleochæte pulvinata A. Braun.

In a glacial pool, growing on Chara. Near Iliuliuk, Unalaska, Alaska, *W.A.S. and A.A.L.*, No. 5039!

Family CLADOPHORACEÆ.

Urospora penicilliformis (Roth) Areschoug.

On rocks, in the litoral zone, sometimes higher up and sometimes very low down. Port Clarence, Alaska, *Kjellman* (1889, p. 55); St. Michael, Alaska, *W.A.S.*, No. 5251!; west shore of Amaknak Island, Bay of Unalaska, Alaska, *W.A.S. and A.A.L.*, No. 3279!; Kukak Bay, Alaska, *Saunders* (1901, p. 413); Strait of Juan de Fuca, B. C., *Harvey* (1862, p. 177, under *Hormotrichum Carmichaelii*); Port Renfrew, B. C., *Butler and Polley*, No. 125; Esquimalt, B.C., *N.L.G.*, No. 514!; west shore of Whidbey Island, Wash., *N.L.G.*, No. 515!

Urospora incrassata Kjellman.

On rocks in the litoral zone. Whidbey Island, Wash., *N.L.G.*, No. 185!

The material seems to Mr. Collins to be of this species.

Urospora Wormskioldii (Mertens) Rosenvinge.

On small stones on exposed coasts. Near Victoria, B. C. *Tilden*, No. 381!; west shore of Whidbey Island, Wash., *N.L.G.*, Nos. 671!, 234!, and in Collins, Holden and Setchell, P. B.-A. No. 915!; San Juan Island, Wash., *N.L.G.*, No. 208!

Mr. Collins expresses the opinion that Miss Tilden's specimens are too near the type to be separated under the varietal name *Vancouveriana* as she has done, and that Gardner's San Juan Island specimens represent a rather slender form.

Chætomorpha cannabina (Areschoug) Kjellman.

Lying loose or entangled among other algæ, in pools, litoral zone. Norton Sound, Alaska, *R. C. McGregor*, No. 5686!; west shore of Amaknak Island, Bay of Unalaska, Alaska, *W.A.S. and A.A.L.*, No. 3244!, and in Collins, Holden and Setchell P. B.-A., No. 916!; St. Paul, Kadiak Island, Alaska, *W.A.S. and A.A.L.*, No. 5141!; Seldovia, Cook Inlet, Alaska, *Saunders* (1901, p. 413); Orca, Alaska, *W.A.S. and A.A.L.*, No. 5169!; Annette Island, Alaska, *Saunders* (1901, p. 413); Friday Harbor, San Juan Island, Wash., *N.L.G.*, No. 219!

Chætomorpha duriuscula (Ruprecht) De Toni.

Unalaska, Alaska, *Ruprecht* (1851, p. 404).

De Toni (1889, p. 277) refers the *Conferva duriuscula* of Ruprecht to the genus Chætomorpha with more or less doubt. We have not seen any plants attributed to this, but judging from the description and the association, it is more likely to be some fragmentary material of Cladophora, upon which the species was founded.

Chætomorpha litorea Harvey.

Sitka, Alaska, *Ruprecht* (1851, p. 399 under *Ch. tortuosa* var. *crassior*).

Harvey (1857, p. 87) refers Ruprecht's variety *crassior* of

Ch. tortuosa to his own *Ch. litorea* and this is as far as any information concerning the plant from Sitka is known to us.

Chætomorpha tortuosa (Dillwyn) Kuetzing.

"Parasitic" on *Ch. melagonium*. Unalaska, Alaska, *Ruprecht* (1851, p. 397, under *Conferva confervicola*).

Harvey (1857, p. 88) says that he has received a specimen of the *Conferva confervicola* Ruprecht from Ruprecht himself and cannot distinguish it from the present species. It seems, also, that the *Conferva Linum* of Postels and Ruprecht (1840, p. 22) may belong with it, since they mention that the specimens referred to that species and collected at Sitka, are only half as thick as European specimens of *Ch. Linum* (Mueller) Kuetzing Another possibility seems likely to us, and that is that the specimens quoted here may also be identical with what Mr. Collins and Kjellman have referred, of North Pacific forms, to *Ch. cannabina*, mentioned above.

Chætomorpha melagonium (Weber et Mohr) Kuetzing.

In tufts over two feet long. Unalaska and Kadiak Islands, Alaska, *Ruprecht* (1851, p. 397, under *Conferva Melagonium*).

Chætomorpha melagonium f. typica Kjellman.

In the sublitoral zone. St. Lawrence Island and Port Clarence, Alaska, *Kjellman* (1889, p. 55); St. Paul Island, Alaska, *Greeley and Snodgrass*, No. 5785a! (Setchell, 1899, p. 590).

Chætomorpha melagonium f. rupincola (Areschoug) Kjellman.

Yakutat Bay, Alaska, *Saunders* (1901, p. 413).

Rhizoclonium riparium f. implexum (Dillwyn) Rosenvinge.

On roots, mud, stones, etc., litoral zone. St. Michael, Alaska, *W.A.S.*, Nos. 5241!, 5244!; east shore of Amaknak Island, Bay of Unalaska, Alaska, *W.A.S. and A.A.L.*, No. 4006!; Yakutat Bay, Alaska, *Saunders* (1901, p. 414); Departure Bay, B. C., *W. A. S. and A. A. L.*, No. 5210!, and in Collins, Holden and Setchell, P. B.-A., No. 976!; Peddler Inlet, Strait of Juan De Fuca, Vancouver Island, B. C., *Tilden*, No. 379! (under *Rh. riparium*); Whidbey Island, Wash., *N.L.G.*, Nos. 296!, 414!; San Juan Island, Wash., *N.L.G.*, No. 205!

Rhizoclonium tortuosum Kuetzing.

On other algæ in the middle litoral zone. Uyak Bay, Kadiak Island, Alaska, *W.A.S. and A.A.L.*, No. 5095!; Whidbey Island, Wash., *N.L.G.*, Nos. 423!, 670!

Cladophora crispata f. vitrea (Kuetzing) Rabenhorst.

Fresh water. University Boat House, Lake Washington, Seattle, Wash., *Tilden*, No. 277!

This form is quoted as Miss Tilden has given it. There are no authentic specimens accessible, either to Mr. Collins or to ourselves, and the specimens must be left for further study.

Cladophora glomerata (L.) Kuetzing.

Lake Scheveltza, Vancouver Island, B. C., *Harvey* (1862, p. 177).

We have no knowledge of the occurrence of this species in our territory except that conveyed by the reference quoted.

Cladophora callicoma Kuetzing.

Attached to floating logs. Lake Washington, Seattle, Wash., *N.L.G.*, Nos. 507!, 508!, and in Collins, Holden and Setchell, P. B.-A., No. 919!, *W.A.S.* and *A.A.L.*, No. 5212!

A fresh water species, determined by Mr. Collins. Dr. Bornet has written that the specimen distributed under Collins, Holden and Setchell, P. B.-A., No. 919, seems to him to be *C. glomerata* f. *macrogonya* (Lyngbye) Rabenhorst.

Cladophora cartilaginea (Ruprecht) Harvey.

Unalaska, Alaska, *Ruprecht* (1851, p. 404 under *Conferva cartilaginea*).

Cladophora saxatilis (Ruprecht) DeToni.

On rocks in the lower part of the litoral zone. Near Friday Harbor, San Juan Island, Wash., *N.L.G.*, Nos. 207!, 220!, *Tilden*, No. 279! (under *C. arcta*); Channel Rocks, west of Seattle, Wash., *N.L.G.*, Nos. 355!, 309!, and in Collins, Holden and Setchell, P. B.-A., No. 921!; Ludlow Bay, Wash., *N.L.G.*, Nos. 440!, 513!

The determination of the above are all by Mr. Collins, who adds that Tilden, No. 375, is not *C. saxatilis*, probably not even

of the same section of the genus, but the specimen distributed is not further determinable.

Cladophora flexuosa (Griffiths) Harvey.

Annette Island, Alaska, *Saunders* (1901, p. 414).

Cladophora Mertensii (Ruprecht) DeToni.

St. Paul Island, Alaska, *Setchell* (1889, p. 590?); Sitka, Alaska, *Ruprecht* (1851, p. 403, under *Conferva Mertensii*).

Cladophora viminea (Ruprecht) DeToni.

Unalaska and Sitka, Alaska, *Ruprecht* (1851, p. 403, under *Conferva viminea*).

Cladophora glaucescens (Griffiths.) Harvey.

Nanaimo, Vancouver Island, B. C., *Harvey* (1862, p. 196).

Cladophora lætevirens (Dillwyn) Kuetzing.

"Fuca Strait," Vancouver Island, B. C., *Harvey* (1862, p. 177).

Cladophora Chamissonis (Ruprecht) DeToni.

"Parasitic" on the walls of Halosaccion or Rhodymenia, Unalaska, Alaska, *Ruprecht* (1851, p. 403); floating, San Juan Island, Wash., *N. L. G.*, No. 232!, and in Collins, Holden and Setchell, P. B.-A., No. 920!

Determined by Mr. Collins, who notes that the specimens of Gardner are so like the Ruprecht specimen in Herb. Farlow, that it should be noted separately from *C. saxatilis* which it resembles very closely.

Cladophora arcta (Dillwyn) Kuetzing.

On rocks and Fucus, middle and lower litoral zones. West shore of Amaknak Island, Bay of Unalaska, Alaska, *W.A.S. and A.A.L.*, No. 3288!; Sand Point, Popof Island, Alaska, *Saunders* (1901, p. 414); Cormorant Rocks, Uyak Bay, Kadiak Island, Alaska, *W.A.S. and A.A.L.*, No. 5133!; St. Paul, Kadiak Island, Alaska, *W.A.S. and A.A.L.*, No. 5140!; Orca, Alaska, *W.A.S. and A.A.L.*, No. 5181!; Ocean Cape, Yakutat Bay, Alaska, *Saunders* (1901, p. 414); Glacier Bay, Alaska, *Saunders* (1901, p. 414); Esquimalt, B. C. and Orcas Island, Wash., *Harvey* (1862, p. 176).

Mr. Collins has made all the determinations quoted except, of course, those of Harvey. Harvey's specimens may belong rather under *C. scopæformis* or *C. saxatilis*, since his *C. arcta* is of the older and broader conception. Mr. Collins also notes that Miss Tilden's *C. arcta* (No. 373) can belong to this species only in its very broadest sense, but that the specimens distributed are not good enough to be determined with accuracy.

Cladophora arcta f. **conglutinata** F. S. Collins f. nov.

Filaments adhering in drying into pointed tufts; descending rhizoids plentiful. In addition to the regular, erect, blunt branches, there are at the base of the older plants some patent lateral branches with acute terminal cells.

On stones and rocks, litoral zone. St. Michael, Alaska, *W.A.S.*, No. 5255x!; near Dutch Harbor, Amaknak Island, Bay of Unalaska, Alaska, *R. C. McGregor*, No. 5693!, *W. A. S. and A.A.L.*, No. 4080!; Karluk, Kadiak Island, Alaska, *W.A.S.*, Nos. 5068!, 5069!; Uyak Bay, Kadiak Island, Alaska, *W.A.S. and A.A.L.*, No. 5086!; Esquimalt, B. C., *N.L.G.*, No. 329!; Channel Rocks, west of Seattle, Wash., *N.L.G.*, No. 356!; near Deer Harbor, San Juan Island, Wash., *N.L.G.*, No. 202! (battered form).

The typical *C. arcta* shows a flabellate or nearly circular outline in the mounted specimen, the individual filaments being quite free. The present form has quite a different habit, the filaments uniting in tufts like a magnified Symploca. The acute lateral branches show a tendency toward *C. spinescens*, but are not regularly curved or circinate as in the latter.

Cladophora arcta f. **pulvinata** (Foslie) F. S. Collins comb. nov.

On mussels and algæ, tide pools, upper litoral zone. West shore of Amaknak Island, Bay of Unalaska, Alaska, *W.A.S. and A.A.L.*, No. 4002!, and in Collins, Holden and Setchell, P. B.-A., No. 918! Determined by F. S. Collins.

Cladophora lanosa var. uncialis (Mueller) Thuret.

On rocks, upper litoral zone. San Juan Island, Wash., *Tilden*, No. 372!

Mr. Collins, after a study of the specimens quoted, says that the plants are certainly not *C. lanosa* var. *uncialis*, being very much coarser, but are in too poor condition for determination.

Cladophora cohærens (Ruprecht) DeToni.

Ruprecht gives this species as occurring in the North Pacific Ocean, and probably from the Ochotsk Sea. Mr. Collins has examined a Ruprecht specimen and notes that he cannot find any differences between this species and *C. arcta* of the North Atlantic.

Cladophora Hystrix (Stroemfelt) DeToni.

On Fucus, lower litoral zone. Gonzales Point, Victoria, B. C., *Tilden*, No. 374! (under *C. arcta* form b.)

Mr. Collins notes that this specimen seems to be Stroemfelt's *Spongomorpha Hystrix*.

Cladophora composita Harvey et Hooker.

Forming dense mats on rocks, litoral zone. Port Renfrew, B. C., *Tilden*, No. 376! (under *C. cartilaginea*); East Sound, Orcas Island, Wash., *N.L.G.*, No. 521!

The determinations are by Mr. Collins, who says of Miss Tilden's specimen that it belongs here and that there are no two species of Cladophora more utterly unlike than *C. composita* and *C. cartilaginea*.

Cladophora Columbiana F. S. Collins sp. nov.

Forming intricate masses about 3 cm. high, filaments somewhat prostrate at the base, then erect, sparingly dichotomous below, densely di- or trichotomously branched towards the fastigiate tips, having occasional solitary or secund lateral branches; filaments 150–250 μ diam., cells somewhat piriform, 3–6 μ diam., long, usually largest at the point of forking, smallest at the base of the cell above; branches and ramuli as large as the main filaments, terminal cell blunt, usually somewhat clavate. Color deep, rich green; cell wall thick, pellucid.

Port Renfrew, B. C., *Butler and Polley!*

Related to *C. patentiramea* (Montagne) Kuetzing., but with larger diameter and shorter cells, and more densely and fastigi-

ately branched. Also resembling some forms of *C. utriculosa* Kuetzing, but a smaller plant, more matted in growth, and with cells cylindrical to piriform, rather than ovoid with constricted nodes. *C. densa* Harvey is looser in growth, with longer cells and subacute tips.

Cladophora coalita (Ruprecht) DeToni.

Attached to rocks in the lower litoral zone. West shore of Whidbey Island, Wash., *N.L.G.*, No. 95!

Mr. Collins writes that this species and the next have been confused under the name of the latter. They are, however, certainly distinct forms, and he is inclined to think, distinct species. No. 819, Collins, Holden and Setchell, P. B.-A., collected at San Francisco, California, by R. E. Gibbs, belongs under the present species and not under the next.

Cladophora scopæformis (Ruprecht) Harvey.

Attached to rocks exposed to considerable wave action. Kukak Bay, Yakutat Bay, and Sitka, Alaska, *Saunders* (1901, p. 414); Port Renfrew, B. C., *Butler and Polley*, No. 16; Esquimalt, B. C., *N.L.G.*, Nos. 323!, 512!, 525!; west shore of Whidbey Island, Wash., *N.L.G.*, No. 18!, 122!, 203!, 516!, 517!, and in Collins, Holden and Setchell, P. B.-A., No. 922!.

This plant which is the most common species in the region of Puget Sound, is closely related to the preceding and the two differ from the other species in our list, with the exception of *C. spinescens*, by having the older parts bound together in rope-like masses by curving and hooked branchlets. *C. coalita* has stouter filaments and shorter cells than *C. scopæformis*. Mr. Collins has supplied the determinations and the notes.

Cladophora spinescens Kuetzing.

In spongy masses, on the tips of algæ and sponges, uppermost litoral zone in exposed places. West shore of Amaknak Island, Bay of Unalaska, Alaska, *W.A.S. and A.A.L.*, No. 3258!

Determined by F. S. Collins.

Cladophora Alaskana F. S. Collins sp. nov.

Tufts 15–25 cm. high, erect, main filaments about 300 μ diam., articulations one-half to one and one-half diam., branches similar, erect, scattered or in secund series of two or more, not tapering, terminal cells blunt, wall thick, striate: branches near base of the tuft slenderer, 200–250 μ diam., with thinner walls, not striate, with numerous short, patent or recurved ramuli, scattered or in secund series. Color dark green, becoming whitish on exposure.

On rocks, forming a distinct belt at the lower tide limit. St. Paul Island, Alaska, Herb. *D. C. Eaton*, No. 4!; west shore of Amaknak Island, Bay of Unalaska, Alaska, *W.A.S. and A.A.L.*, Nos. 3259!, 4000!, 5045a!, and in Collins, Holden and Setchell, P. B.-A., No. 917!

The slender divaricate lower branches resemble somewhat the interlacing branches in the subgenus Spongomorpha, but they are not clearly differentiated, the two forms of branches in this species passing into each other. The tufts are never densely matted as in Spongomorpha.

Cladophora Hutchinsiæ var. distans Kuetzing.

Port Renfrew, B. C., *Butler and Polley*, No. 127!

Mr. Collins says of this, that it may be the plant called *C. laterirens* by Harvey in his "List" (1862), but that it is not the plant properly to be placed under that name.

The species of Cladophora are always difficult to determine, and this is especially true of the species of the Pacific Coast of North America. All of our material has been sent to Mr. Collins and besides his special reports on each specimen, he has written the following account of the result of his study of the Ruprecht descriptions, supplemented by a considerable number of Ruprecht specimens in Herb. Farlow. His report reads as follows:

"Ruprecht gives nine species, all of the Acrosiphonia-group as follows:

1. C. cohærens.
2. C. Chamissonis.
3. C. Mertensii.
4. C. viminea.
5. C. saxatilis.
6. C. duriuscula.
7. C. cartilaginea.
8. C. scopæformis.
9. C. coalita.

C. cohærens according to Ruprecht, represents *C. arcta* of the Atlantic, and is possibly only a form of the latter. I cannot see any differences, and have simply called the specimens *C. arcta*. The next four species seem to me to be indistinguishable, either by the authentic specimens or by the descriptions. I have used the name *C. saxatilis*, both as the first name used, and the one having the fullest description. *C. duriuscula* is not represented in the herbarium and I do not think that it can be made out from the description. *C. cartilaginea* is a well marked species, but is not among the specimens you have sent me; it is in my collection from Monterey. The last two species have been confused under the name *C. scopæformis*, but are certainly distinct forms, and I am inclined to think, distinct species. Both are coarse plants, all the older parts matted in rope-like masses by curving and hooked branches. *C. coalita* has stouter filaments and shorter cells. The hooked branches are characteristic of these two species, and seldom if ever found in the other species of this list. These two species have very blunt tipped branches, while the Ruprecht specimens of *C. Chamissonis*, *C. viminea*, and *C. saxatilis*, all have the tips acute or acuminate. The mattedness of the lower part of the last three species is not due to hooked branchlets, but to descending rhizoid-like branchlets as in *C. arcta*. *C. polaris* Harvey, New Algæ of Japan, Proc. Amer. Acad., Vol. 4; p. 334, 1859, is the young state of *C. scopæformis*."

Family GOMONTIACEÆ.

Gomontia polyrhiza (Lagerheim) B. & F.

In dead shells. Amaknak Island, Bay of Unalaska, Alaska, *W.A.S. and A.A.L.*, No. 3248!; Popof Island, Alaska, *Saunders* (1901, p. 415); Harvester Island, Uyak Bay, Kadiak Island, Alaska. *W.A.S. and A.A.L.*, No. 5110!

Family BOTRYDIACEÆ.

Botrydium granulatum (L.) Greville.

This species has been seen and collected on Camano and Whidbey Islands by one of us (*N.L.G.*) but no specimens were preserved. There is, however, no doubt as to its occurrence.

Family BRYOPSIDACEÆ.

Bryopsis hypnoides Lamouroux.

Growing on old wood of floats and piles. Victoria, B. C., *N.L.G.*, No. 510!; British Camp, San Juan Island, Wash., *N.L.G.*, No. 206!

Determined by F. S. Collins.

Bryopsis corticulans Setchell.

On rocks at low water mark. Sackman's Point, near Tracyton, Kitsap County, Wash., *Tilden*, No. 371! (under *B. plumosa*).

This differs from *B. plumosa*, in being coarser and less regularly distichous, but the corticating filaments are very nearly wanting. It seems best to refer it to *B. corticulans*, which may, however, only be an extreme form of *B. plumosa*. Mr. Collins notes that the specimen in the copy of the American Algæ in Herb. Farlow, seems to be good *B. corticulans*.

Family DERBESIACEÆ.

Derbesia vaucheriæformis (Harvey) J. Agardh.

On a sponge. Yakutat Bay, Alaska, *Saunders* (1901, p. 415).

Derbesia marina (Lyngbye) Solier.

In quiet water. Sitka, Alaska, *Saunders* (1901, p. 415).

Family VAUCHERIACEÆ.

Vaucheria sessilis (Vaucher) DC.

On a dripping cliff, Juneau, Alaska, *Saunders* (1901, p. 415); in a small stream of running water, Seattle, Wash., *N.L.G.*, No. 384!

Vaucheria geminata var. **racemosa** Walz.

Seattle, Wash., *N.L.G.*, No. 668!

Vaucheria hamata (Vaucher) Lyngbye.

On moist ground. Near Green Lake, Seattle, Wash., *N.L.G.*, No. 368!

Vaucheria terrestris Lyngbye.

In a ditch. Near the University of Washington, Seattle, Wash., *N.L.G.*, No. 392!

Family CODIACEÆ.

Codium adhærens (Cabr.) Agardh.

Dredged in a depth of 15 meters, Kadiak Island, Alaska, *Saunders* (1901, p. 416); very sparingly on rocks in the upper sublitoral zone, west shore of Whidbey Island, Wash., *N.L.G.*, No. 265!

Codium Ritteri Setchell and Gardner sp. nov. Plate 17.

Frond globose to piriform, 3 cm. high, attached by a distinct stipe-like base, solid, the center composed of a felt-like mass of fine fibres. Outer filaments or utricles, free, blunt, 150–400 μ in diameter, the older ones usually swollen in the middle, and having the membrane at the tip somewhat thickened at the central point projecting inwards. Zoosporangia unknown.

The type of the species proposed here is a single specimen collected at Berg Bay, in two or three fathoms of water, by Professor W. E. Ritter, of the University of California, while on the Harriman Expedition to Alaska. A second specimen, agreeing apparently in habit and structure, but not in the description of its habit, is No. 370 of Miss Tilden's American Algæ, collected by her at Port Renfrew, Vancouver Island, B. C., and distributed under the name of *Codium adhærens*.

Codium Ritteri approaches both *C. Bursa* (Turner) Agardh and *C. mamillosum* Harvey, but is distinct from both. From the former it differs in being solid and in having a more distinct stipital portion, while from the latter it differs in having a more distinct stipital portion and the smallness of the utricles as well as the shape of the utricles. The utricles, in a specimen of Mme. Weber van Bosse, kindly loaned by F. S. Collins, are balloon-shaped, and measure from 1 to 2 mm. in diameter. From *C. adhærens*, *C. Ritteri* is amply distinct, since it has not the firm jelly uniting the utricles, which is so characteristic of that species. It is to be noted that *C. mamillosum* is credited to

Japan by DeToni (1895, p. 63), but No. 49 of Okamura's Algæ Japonicæ Exsiccatæ, seems to us to be our *C. Ritteri*, though labelled *C. mamillosum*.

Codium mucronatum f. Californicum J. Agardh.

On rocks and in tide pools, lower litoral and upper sublitoral zones. Sitka, Alaska, *J. G. Agardh* (1886, p. 44), *Saunders* (1901, p. 416); San Juan Harbor, Strait of Juan de Fuca, Vancouver Island, B. C., *Tilden*, No. 281!, under *C. tomentosum*; Whidbey Island, Port Townsend, and Ludlow Bay, Wash., *N. L. G.*!

In all probability are to be included here, the specimens referred to *C. tomentosum* as follows: — Norfolk Sound (Sitka Sound) and Nootka Sound, *Postels and Ruprecht* (1840, p. 20); Nootka Sound, *Turner* (1811, p. 135, under *Fucus tomentosus*); Esquimalt, B. C., *Harvey* (1862, p. 176).

Codium mucronatum f. Novæ Zelandiæ J. Agardh.

Port Renfrew, B. C., *Butler and Polley*, No. 5!

A careful study of *C. mucronatum* will probably show a very decided variation in the size and occurrence of the mucronate tip of the utricle. In the plants included under the preceding form, all studied by us have the typical tip of the f. *Californicum*. In the plant quoted under the present form, the mucronate tip to the utricle is to be found only in the very young portions of the frond. Below, in the older portions, the utricles are more or less swollen at the tip, as in *C. Muelleri* Kuetzing, and while some of them show a very slight apiculus, the majority of them do not. The plant certainly differs from the more usual form on the Pacific Coast of North America.

Family VALONIACEÆ.

Valonia ovalis (Lyngbye) Agardh.

On rocks exposed to the waves at extreme low water mark. Port Renfrew, B. C., *Butler and Polley*, No. 26!

This northern representative of a tropical genus was first found on the Pacific Coast of North America by Saunders (1899, p. 2) near Pacific Grove, California. It has also been collected

at Point Cypress, near Pacific Grove, by Professor Harold Heath, of Stanford University. In both these localities, as well as in the locality quoted above, it was found growing on a substratum of Lithothamnia.

Family CHARACEÆ.

Nitella acuminata subglomerata A. Braun.

In a fresh water pond, near Prince William Sound, Alaska, *Saunders* (1901, p. 416).

Nitella opaca Agardh?

In a fresh water pond near Kadiak, Alaska, *Saunders* (1901, p. 416).

Chara contraria A. Braun.

In ponds and streams near Glacier Bay, Alaska, *Saunders* (1901, p. 416).

Chara fragilis Desv.

In a fresh water pond, Shumagin Islands, Alaska, *Saunders* (1901, p. 416).

PHÆOPHYCEÆ.

In this group we have included all algæ with an additional brown coloring matter, even taking in Hydrurus, which does not seem to belong anywhere. In the arrangement of genera and in the adoption of generic names, we have followed Kjellman (1891–1896) in Engler and Prantl, with some exceptions, particularly in the Laminariaceæ. As to species, while DeToni (1895) has been of considerable assistance, it has been necessary to rely chiefly upon the special papers for more light to determine doubtful points and to make necessary revisions. In this group much help is to be obtained from the papers of Mertens (1829), Postels and Ruprecht (1840), Ruprecht (1851), and Saunders (1901). We have the pleasure of thanking Mr. Collins for some determinations, and for looking over our manuscript and making valuable suggestions. Professor F. R. Kjellman, of Upsala, Sweden, very kindly examined a series of specimens of the very puzzling

genus Alaria and contributed determinaions and notes without which our account would have been extremely meager.

In this group we find a mixture of forms of North Atlantic affinities mixed with types of Antarctic affinities. The genera Macrocystis, Nereocystis, Lessonia, Postelsia, Dictyoneuron, and Egregia are most closely related to Laminariaceæ of the Antarctic Ocean, some species of Chorda, Laminaria, Agarum, Alaria, and Fucus are identical with those of the North Atlantic, while others of the same genera are very closely related to the North Atlantic forms. We have selected the species and genera just mentioned, because they are large and typical. A detailed list would only show the same thing and make the proportions plain. The proportions, however, if taken from such a list as could be compiled at present, would probably not hold as soon as we have a little more complete knowledge than we have at present. In the group of the Phæophyceæ, too, we see the mingling of the algal flora of the North Temperate Region and the Lower Boreal Region very plainly. The Antarctic types belong properly with the North Temperate, although some of them, notably Nereocystis, extend through the Lower Boreal, but are wanting, as we have reason for believing, in the Upper Boreal. The North Atlantic types, on the other hand, are characteristic of the Lower Boreal and are represented in the North Temperate by fewer species or mostly by species related to, but not identical with, the species of the North Atlantic. A comparison with the Phæophyceæ of the northeastern coast of Asia, is not possible, at least with the expectation of satisfactory results. The algal flora of Ochotsk Sea, is very similar to that of Bering Sea, and this Upper Boreal flora reaches to the northern extremity of Japan, but beyond that our present knowledge of the flora of Japan in the Lower Boreal Region is not sufficient to allow any very definite statements to be made. A comparison with the coasts of the United States below Cape Flattery might be made, especially with those included in the North Temperate Region, but it is sufficient to say that many of the species of that flora have already been found in the lower limits of the Lower Boreal Region and many more will probably be added when our knowledge approximates completeness.

Family HYDRURACEÆ.

Hydrurus fœtidus (Vill.) Kirchner.

On rocks and stones in cold rapid streams. Near Iliuliuk, Unalaska, Alaska, *W.A.S. and A.A.L.*, No. 5042!; Kukak Bay, Alaska, *Saunders* (1901, p. 400); Juneau, Alaska, *W.A.S. and A. A. L.*, No. 5189!; Vancouver Island, B. C., *Harvey*, (1862, p. 177).

This species occurs in several of its forms in each Alaskan locality.

Family ECTOCARPACEÆ.

Pylaiella litoralis (L.) Kjellman.

Attached to various algæ or woodwork. St. Lawrence Island and Port Clarence, Alaska, *Kjellman* (1889, p. 51); Norton Sound, Alaska, *R. C. McGregor*, No. 5678!; "Fuca Strait" and Esquimalt, B. C.. *Harvey* (1862, p. 167).

This very variable species has been divided into a number of varieties and forms by Kuckuck, Kjellman, and other writers. The specimens and references given above are not referable easily under their proper forms and are mentioned here. Below are given such as are more or less readily referred under published varietal and form names. It seems that the following two species are probably to be placed under *P. litoralis*, also: P. *atroviolacea* Ruprecht (1851, p. 385) from Sitka and perhaps also from Unalaska, collected by Mertens, and *Ectocarpus Aleuticus* Kuetzing (1860, p. 1, pl. 2, 1) also collected at Unalaska by Mertens.

Pylaiella litoralis var. **opposita** f. **typica** Kjellman.

On Fucus, St. Michael, Alaska, *W.A.S.*, Nos. 5238y!, 5247x!

Pylaiella litoralis var. **opposita** f. **rupincola** Kjellman.

On piles or floating logs. Iliuliuk, Unalaska, Alaska, *W.A.S. and A.A.L.*, No. 4025!; LaConner, Skagit County, Wash., *N.L.G.*, No. 339!

Pylaiella litoralis var. **opposita** f. **acuta** Saunders.

On Fucus, Kukak Bay, but generally abundant from Wrangell, Alaska, to the Aleutian Islands, *Saunders* (1901, p. 418).

It has seemed best to place Saunders's form under the variety *opposita*, as Saunders leaves it indefinite in this case as he does in the whole treatment of this species as to whether he recognizes any special grouping of the forms or not. The general grouping of Kuckuck and Kjellman seems to us the most convenient and natural arrangement possible and to be followed as nearly as can be done, with the understanding that a study of the life-history may indicate that many of the forms are rather states of development. Saunders's description of the form does not seem to indicate much difference between this and f. *rupincola* Kjellman.

Pylaiella litoralis var. opposita f. rectangulans Kuckuck.

Floating in pools in a salt marsh. Orcas Island, Wash., *N.L.G.*, No. 627!

Pylaïella litoralis var. firma (Agardh) Kjellman.

On Fucus. Dutch Harbor, Amaknak Island, Bay of Unalaska, Alaska, *R. C. McGregor*, No. 5696!; Iliuliuk, Unalaska, Alaska, *W.A.S. and A.A.L.*, No. 3271!; Harvester Island, Uyak Bay, Kadiak Island, Alaska, *W.A.S. and A.A.L.*, No. 5103!; East Sound, Orcas Island, Wash., *N.L.G.*, No. 476!

These forms are all lumped under the variety without attempt to separate them. One or two of them probably belong to f. *typica* Kjellman.

Pylaiella litoralis var. firma f. macrocarpa (Foslie) Kjellman.

On Fucus. Victoria, B. C., *Saunders* (1901, p. 419).

Pylaiella litoralis var. varia (Kjellman) Kuckuck.

Common on rocks and on Fucus. Shumagin Islands, Yakutat, and Juneau, Alaska, and at Victoria, B. C., *Saunders* (1901, p. 419); Port Renfrew, B. C., *Tilden*, No. 360!

Pylaiella litoralis var. varia f. densa Saunders.

On Fucus or other algæ, occasionally upon rocks. Shumagin Islands, Prince William Sound, and Sitka, Alaska, and Victoria, B. C., *Saunders* (1901, p. 419); Uyak Bay, Kadiak Island, Alaska, *W.A.S.* and *A.A.L.*, No. 5135a!; Saunders's f. *densa* seems to come under the var. *varia* (Kjellman) Kuckuck.

Ectocarpus terminalis Kuetzing.

On stipes of *Alaria fistulosa* P. & R. Iliuliuk, Unalaska, Alaska, *W.A.S.* and *A.A.L.*, No. 5044a!

Ectocarpus siliculosus f. typicus Kjellman, emend. Kuckuck.

On wood. Juneau, Alaska, *W.A.S.* and *A.A.L.*, No. 5197!

The specimens referred to the species are very typical and with good plurilocular sporangia. Harvey (1862, p. 167) has noted this species from Esquimalt, B. C., growing on Nereocystis.

Ectocarpus confervoides (Roth) LeJolis.

On rocks, etc. Yakutat, Alaska, *Saunders* (1901, p. 418); Port Renfrew, B. C., *Butler and Polley*, No. 24; near Coupeville, Whidbey Island, Wash., *N.L.G.*, No. 261!

These may be forms more or less typical, but the information is not exact in this respect.

Ectocarpus confervoides f. typicus Kjellman.

On Alaria. Juneau, Alaska, *W.A.S.* and *A.A.L.*, No. 5196! =

Ectocarpus confervoides f. pygmæus (Areschoug) Kjellman.

On various algæ. Shumagin Islands and Yakutat Bay, Alaska, *Saunders* (1901, p. 418).

Ectocarpus confervoides f. **acuminatus** Collins and Setchell f. nov.

Habit and plurilocular sporangia of *E. penicillatus* Agardh, but the branches and branchlets are acuminate instead of ending in a hair.

On algæ, particularly Desmarestia. Whidbey Island, Wash., *N.L.G.*, Nos. 235!, 448!; Victoria, B. C., *N.L.G.*, No. 317!

The type is No. 235 and seems to be the same as the *E. penicillatus* of Saunders's Phycological Memoirs (1898, p. 155, pl. 21, f. 3, 4). It differs from *E. penicillatus* as figured and described by Kuckuck (1891, p. 22, f. 5) in the lack of hairs and in the lack of the pseudodichotomous branching. It is to be distinguished from other forms of *E. confervoides* by the acuminate terminal cells of the branches and branchlets.

Ectocarpus confervoides f. variabilis Saunders.

On larger algæ and on a chiton. West coast of Whidbey Island, Wash., *N.L.G.*, Nos. 166!, 426!, 454!, 465!

The plants placed under this form are referred here with some doubt and need more study, as does the form itself, to determine its autonomy. Some of the plants make it seem likely that *E. chitinicolus* Saunders, and perhaps even *E. mucronatus* Saunders, are likely to be found to belong to the form cycle of *E. confervoides*.

Ectocarpus confervoides f. corticulatus Saunders.

On *Desmarestia aculeata*. Popof Island, Alaska, *Saunders* (1901, p. 418).

Ectocarpus granulosus (Engl. Bot.) Agardh.

Cast ashore. Near Tracyton, Kitsap County, Wash., *Tilden*, No. 359a!

A slender form of this species. Mr. F. S. Collins has examined the specimen in Herb. Farlow and agrees in the determination. No. 359b is referred by him to *E. mucronatus* Saunders.

Ectocarpus mucronatus Saunders.

In tide pool. Port Renfrew, B. C., *Tilden*, No. 359b!, under *E. granulosus*.

Mr. F. S. Collins has determined this specimen as belonging to this species. It seems to us that the species itself may probably be referred to some form of *E. confervoides*, on further study.

Ectocarpus tomentosus (Hudson) Lyngbye.

On Fucus. Harvester Island, Uyak Bay, Kadiak Island, Alaska, *W.A.S. and A.A.L.*, No. 5104!; Sitka, Alaska, and Victoria, B. C., *Saunders* (1901, p. 417).

Ectocarpus oviger Harvey.

On stipes of Nereocystis. Esquimalt, B. C., *Harvey* (1862, p. 167).

A species unknown to us, said to be near to *E. granulosus* (Engl. Bot.) Agardh.

Ectocarpus cylindricus Saunders.

On the shell of a chiton. West coast of Whidbey Island, Wash., *N.L.G.*, No. 466!

Determined by DeAlton Saunders.

Streblonema minutissimum Saunders.

"In the branches of Liebmannia sp." Sitka, Alaska, *Saunders* (1901, p. 416).

Streblonema Pacificum Saunders.

Forming dark brown, circular patches on the sporophylls of Alaria. Yakutat Bay, Alaska, *Saunders* (1901, p. 417).

Streblonema irregulare Saunders.

Forming small brown patches on the bulbs of Nereocystis. Sitka, Alaska, *Saunders* (1901, p. 417).

Phycocœlis Baltica (Reinke) DeToni.

On various algæ. Sitka, Alaska, *Saunders* (1901, p. 416); west coast of Whidbey Island, Wash., *N.L.G.*, No. 454!

Placed by Foslie under *Myrionema*.

Family SPHACELARIACEÆ.

Sphacelaria cirrhosa (Roth) Agardh.

Forming small light olive-green tufts on Fucus. Annette Island, Alaska, *Saunders* (1901, p. 419).

Sphacelaria racemosa var. arctica (Kjellman) Reinke.

St. Lawerence Island and Port Clarence, Alaska, *Kjellman* (1889, p. 51); Prince William Sound, Yakutat, and Wrangell, Alaska, *Saunders* (1901, p. 419); west coast of Whidbey Island, Wash., *N.L.G.*, No. 245!

Chætopteris plumosa (Lyngbye) Kuetzing.

Sublitoral zone. St. Lawrence Island and Port Clarence, Alaska, *Kjellman* (1889, p. 51); Alaska, *Harvey* (1872, p. 463).

Cladostephus verticillatus (Lightfoot) Agardh.

North Pacific Ocean, *Postels* and *Ruprecht* (1840, p. 21).

Family ENCŒLIACEÆ.

Desmotrichum undulatum (J. Agardh) Reinke.

On *Zostera marina*, in a quiet cove. Near Seldovia, Cook Inlet, Alaska, *Saunders* (1901, p. 419, under *Homœostroma undulatum.*)

This seems more like a narrow Punctaria, since according to both the description and figure of Saunders the plurilocular sporangia hardly project beyond the surface of the frond.

Punctaria latifolia Greville.

In quiet waters, floating or attached to other algæ. Popof Island, Sitka, and Annette Island, Alaska, *Saunders* (1901, p. 420, under *Homœostroma latifolium*); Penn's Cove, near Coupeville, Whidbey Island, Wash., *N.L.G.*, No. 190!

Homœostroma lobatum Saunders, from Sitka and Prince William Sound, Alaska, seems from description and figure to be a form of this species or the next with much lobed margins. It reminds us of *Phycolapathum crispatum* Kuetzing (1856, p. 16, pl. 49, f. I).

No. 190, N.L.G., may be a distinct form, since it reaches a diameter of over a meter and seems to increase, in its floating state, indefinitely, in a way similar to that of *Ulva Lactuca* var. *latissima.*

Punctaria plantaginea (Roth) Greville.

On exposed rocks. Port Clarence, Alaska, *Kjellman* (1889, p. 50); Yakutat Bay, Alaska, *Saunders* (1901, p. 420).

Coilodesme bulligera Stroemfelt.

On rocks and stones, in quiet coves, in the lower litoral zone. Amaknak Island, Bay of Unalaska, Alaska, *W.A.S. and A.A.L.*, Nos. 3285!, 4081!, and in Collins, Holden and Setchell, P. B.-A., No. 923b!; Shumagin Islands, Kukak Bay, Prince William Sound, Yakutat Bay, and Wrangell, Alaska, *Saunders* (1901, p. 422), and in Collins, Holden and Setchell, P. B.-A., No. 923a!; west coast of Whidbey Island, Wash., *N.L.G.*, No. 201!

It is very interesting to note the common occurrence of this species in the Northern Pacific Ocean, at least so far as the North American Coast is concerned, since before the collections

noted (made in the year 1899) it was unknown, except from the Arctic coasts of Norway, Iceland and Greenland.

Coilodesme Californica (Ruprecht) Kjellman.

Epiphytic on *Cystophyllum geminatum*. Yakutat Bay, Wrangell, and Annette Island, Alaska, *Saunders* (1901, p. 422); Port Renfrew, B. C., *Butler and Polley*; Esquimalt, B. C., *W.A.S.*, No. 1874!; Victoria, B. C., *Saunders* (1901, p. 422); west coast of Whidbey Island, Wash., *N.L.G.*, No. 679!; Friday Harbor, San Juan Island, Wash., *Tilden*, No. 354!

Coilodesme Cystoseirae (Ruprecht) Setchell and Gardner comb. nov.

Asperococcus Cystoseiræ Ruprecht, Tange Och., p. 370, 1851.

Coilodesme linearis Saunders, Alaskan Algæ, p. 421, pl. 48, 1901, and in Collins, Holden and Setchell, P. B.-A., No. 824, 1901.

On *Cystophyllum geminatum*. Popof Island and Kukak Bay, Alaska, *Saunders* (1901, p. 421) and in Collins, Holden and Setchell, P. B.-A., No. 824!; Yakutat Bay, Alaska, *Rev. Albin Johnson*, No. 5698!

Ruprecht's description of this species is very explicit, not only of the habit and habitat, but also of the microscopic structure, so that there can be no doubt as to the identity of the two sets of plants. From Ruprecht's account it seems to be abundant in the Ochotsk Sea. While the extreme forms of these two species on Cystophyllum are amply distinct, there are narrower forms of *C. Californica*, approaching to some extent the more robust *C. Cystoseiræ*, so that it does not seem impossible that the latter may be only a pronounced geographical variety of the former.

Myelophycus intestinalis Saunders.

Attached to rocks in the more quiet waters in the lower litoral and upper sublitoral zones. Near Iliuliuk, Unalaska, Alaska, *W.A.S. and A.A.L.*, Nos. 3287!, 4019!; Popof Island, Alaska, *Saunders* (1901, p. 420) and in Collins, Holden and Setchell, P. B.-A., No. 872!; Yakutat Bay, Glacier Bay, and Sitka, Alaska, *Saunders* (1901, p. 420); Fairhaven and Whidbey Island, Wash., *N.L.G.*, Nos. 188!, 215!

While this species seems to be a *Myelophycus* in Kjellman's sense, yet it seems to us that the whole question of the relation of this genus to *Analipus* and to *Chordaria* is very unsatisfactory as yet. Younger plants of this species are needed for study in this connection, so that the region or regions of growth may be more definitely established. Further discussion will be found under Chordaria and Analipus.

Colpomenia sinuosa (Roth) Derbes et Solier.

Growing on other algæ, in the lower litoral zone. Prince William Sound and Yakutat Bay, Alaska, *Saunders* (1901, p. 421); Port Renfrew, B. C., *Tilden*, No. 522!, *Butler and Polley*, No. 111!

The specimens included here are evidently the thinner forms, or may be even states due to age, which Saunders has considered the typical form. While we cannot refer to the type to settle the question, we believe that the thinner forms, whether single and more regular in shape (*C. sinuosa* Saunders, 1896, p. 164, pl. 32, f. 7, 8) or the aggregate expanded forms (*C. sinuosa expansa* Saunders, 1898, p. 164, pl. 32, f. 4–6) are merely younger plants which become thicker and darker brown as they become older

Colpomenia sinuosa f. **tuberculata** (Saunders) Setchell and Gardner comb. nov.

C. tuberculata Saunders, Phycological Memoirs, p. 164, pl. 32, f. 1–3, 1898.

On other algæ in the lower litoral zone. Northeast shore of Captains Bay, Unalaska, Alaska, *W.A.S. and A.A.L.*, No. 4090!; west coast of Whidbey Island, Wash., *A.L.G.*, No. 106!

This plant, as it seems to us from a study not only of material from the northwest coast, but also from a study of Californian specimens, is only a somewhat thicker, more or less distorted form of *C. sinuosa*, and we feel that all the autonomy necessary is indicated by a different form-name.

Colpomenia sinuosa f. **deformans** Setchell and Gardner nom. nov. Plate 18.

Scytosiphon bullosus Saunders, Phycological Memoirs, p. 163, pl. 31, f. 1–7, 1898.

On rocks in the lower litoral zone. Seldovia, Cook Inlet, Alaska, *Saunders* (1901, p. 421) and in Tilden, American Algæ, No. 351b!; Sitka, Alaska, *Saunders* (1901, p. 421); all under *Scytosiphon bullosus*.

A careful comparison of the specimens of this species of Saunders as to the specimens distributed and as to the plants in the type locality at Pacific Grove, California, has convinced us that every stage can be found, sometimes even in the same bunch of plants, from typical *C. sinuosa*, as Saunders regards it, to typical *Scytosiphon bullosus* as Saunders has figured and distributed it. The series of figures (pl. 18, f. 13–15) drawn from Californian material, shows how the lobes of this form take on various shapes, and when we have one or more long finger-shaped lobes far exceeding the others, then, we have a plant approximating very nearly, at least,to the type of *Scytosiphon bullosus*. A similar form is described below under *Soranthera ulvoidea* P. & R.

Scytosiphon lomentarius (Lyngbye) J. Agardh.

On rocks and stones in the litoral zone. Distributed along the whole western coast of North America: Port Clarence, Alaska, *Kjellman* (1889, p. 50); St. Paul Island, Alaska, *Greeley and Snodgrass*, No. 5808! (Setchell, 1889, p. 591); west shore of Amaknak Island, Bay of Unalaska, Alaska, *W.A.S. and A.A.L.*, No. 3282!; Unalaska, Alaska, *Postels and Ruprecht* (1840, p. 19, under *Chorda filum* var. *fistulosa*); Uyak Bay, Kadiak Island, Alaska, *W.A.S. and A.A.L.*, No. 5087!; Shumagin Islands, Kukak Bay, Yakutat Bay, Glacier Bay, Sitka, and Annette Island, Alaska, *Saunders* (1901, p. 421); Port Renfrew, B. C., *Tilden*, No. 347b!, under *Chordaria attenuata;* San Juan Island, Wash., *Tilden*, No. 347a!, under *Chordaria attenuata;* west coast of Whidbey Island, Wash., *N.L.G.*, No. 100!; Friday Harbor, San Juan Island, Wash., *Tilden*, No. 246!

Scytosiphon lomentarius f. complanatus Rosenvinge.

Glacier Bay and Juneau, Alaska, *Saunders* (1901, p. 421).

Phyllitis fascia (Mueller) Kuetzing.

On stones in the lower litoral zone. Iliuliuk, Unalaska, Alaska, *W.A.S. and A.A.L.*, No. 4016!; Uyak Bay, Kadiak

Island, Alaska, *W.A.S. and A.A.L.*, Nos. 5075!, 5098!; Kukak Bay, Cook Inlet, Yakutat Bay, Glacier Bay, and Annette Island, Alaska, *Saunders* (1901, p. 421); Esquimalt, B. C., *Harvey* (1862, p. 167); west coast of Whidbey Island, Wash., *N.L.G.*, No. 200!

Soranthera ulvoidea P. & R.

On *Odonthalia floccosa* and *Rhodomela Larix*, in the lower litoral zone. Yakutat Bay, Alaska, *Saunders* (1901, p. 422); Sitka, Alaska, *Postels and Ruprecht* (1840, p. 19); Wrangell, Alaska, and Victoria, B. C., *Saunders* (1901, p. 422); Port Renfrew, B. C., *Butler and Polley*, No. 104.

The plants noted here are known to us only from the references and are placed under the species without comment. The plants examined are grouped under two forms as given below.

Soranthera ulvoidea f. **typica** Setchell and Gardner nom. nov.

Habitat same as preceding. West coast of Whidbey Island, Wash., *N. L. G.*, No. 107!; Friday Harbor, San Juan Island, Wash., *Tilden*, No. 245!

The typical form of this species as described by Postels and Ruprecht is nearly regular in outline, either oval ellipsoidal, or very nearly globular. This is the plant figured by Kjellman (1889, pl. 7, f. 4, 5) and also, less typically, by Saunders (1898, pl. 29, f. 4, 5) and distributed by the latter in Collins, Holden and Setchell, P. B.-A., No. 417. The two specimens noted above also belong to the type as it seems to us. The more common northern form is the following.

Soranthera ulvoidea f. **difformis** Setchell and Gardner f. nov.

Frond variously and deeply lobed, sometimes very irregularly so.

On same hosts as the two preceding. East shore of Amaknak Island, Bay of Unalaska, Alaska, *W.A.S. and A.A.L.*, No. 3276!; near Iliuliuk, Unalaska, Alaska, *W.A.S. and A.A.L.*, No. 4073!; Uyak Bay, Kadiak Island, Alaska, *W.A.S. and A.A.L.*, No. 5081!· St. Paul, Kadiak Island, Alaska, *W.A.S. and A.A.L.*, No. 5145!; Yakutat Bay, Alaska, *Rev. Albin Johnson*!

This form seems to prefer impure water, either brackish or muddy.

FAMILY STRIARIACEÆ.

Phlœospora tortilis (Turner) Areschoug.

On stones, in quiet and somewhat brackish water. Golofnin Bay, Alaska, *R. C. McGregor*, Nos. 5668!, 5676!; lagoon near Summer Bay, Unalaska, Alaska, *W.A.S. and A.A.L.*, No. 4069!, in Collins, Holden and Setchell, No. 987!, under *Stictyosiphon tortilis*.

No. 5676 has excellent sporangia, the other numbers are largely sterile.

Phlœospora subarticulata Areschoug.

Port Clarence, Alaska, *Kjellman* (1889, p. 50).

By some authors, this species is not considered distinct from the preceding.

Striaria attenuata (Agardh) Greville.

Orcas Island, Wash., and Vancouver, B. C., *Harvey* (1862, p. 167).

The reference quoted above is the only reason known to us for including this species in our account.

FAMILY DESMARESTIACEÆ.

Desmarestia viridis (Mueller) Lamouroux.

On stones in the upper sublitoral region. Captains Bay, Unalaska, Alaska, *A.A.L.*, No. 5015!; Prince William Sound and Glacier Bay, Alaska, *Saunders* (1901, p. 422); Esquimalt, B. C., *Harvey* (1862, p. 164).

The occurrence of this species in our territory is not altogether satisfactorily known to us. No. 5015 seems to be this species rather than *D. aculeata* f. *media* (Agardh) J. Agardh, which it resembles in its older states. This resemblance and lack of careful study of the two forms, makes it uncertain at times, to which species the references refer. Saunders says that it is not uncommon, but less abundant than *D. aculeata*. *D. viridis* f. *major* P. & R. (1840, p. 13) seems from the description to be a form of the following species. It was collected at Unalaska.

Desmarestia aculeata (L.) Lamouroux.

Floating, or attached to stones in the upper sublitoral zone. St. Lawrence Island, Alaska, *Kjellman* (1889, p. 50); St. Paul Island, Alaska, *Greeley and Snodgrass*!, (Setchell 1899, p. 591); Kyska Island, Alaska, *Townsend*, No. 5774!; near Iliuliuk, Unalaska, Alaska, *W.A.S. and A.A.L.*, Nos. 4036!, 4065!; Shumagin Islands, Alaska, *Saunders* (1901, p. 422); Uyak Bay, Kadiak Island, Alaska, *W.A.S. and A.A.L.*, No. 5136a!; Kukak Bay, Yakutat Bay, Sitka, and Wrangell, Alaska, and Victoria, B. C., *Saunders* (1901, p. 422); Esquimalt, B. C., *Harvey* (1862, p. 164. in 8–10 fathoms of water); Puget Sound, *Bailey and Harvey* (1862, p. 160); Whidbey Island, Wash., *N.L.G.*, No. 118!; North Bay, San Juan Island, Wash., *Tilden*, No. 352!

The specimens from the localities mentioned above, are all, or at least as far as the specimens examined are concerned, of the typical form or very near it. Some of them are rather broad, but, unless we subdivide the species under several forms, they are to be included here and not at all under the following form which is decidedly distinct.

Desmarestia aculeata f. media (Agardh) J. Agardh.

Floating, probably coming from the sublitoral zone, where it grows on shells and rocks. Captains Bay, Unalaska, Alaska, *W.A.S. and A.A.L.*, No. 4087!; Unalaska, Alaska, *Agardh*, (1821, pl. 16, under *Sporochnus medius*), *Postels and Ruprecht* (1840, p. 13, under *D. intermedia*), *Ruprecht* (1851, p. 375, under *Spinularia media*); Unga, Alaska, *J. B. Downing*!; Douglas, Alaska, *Eldred Jenne*!; Sitka, Alaska, *Ida M. Rodgers*, No. 5728!; Minnesota Reef, San Juan Island, Wash., *Tilden*, No. 353!, under *D. viridis*.

The plants considered under this form are so distinct from the ordinary typical *D. aculeata*, that we are sorely tempted to restore them to specific rank. They lack the flattened character of the fronds of the type, the stem and branches being nearly, if not quite, terete. The opposite branches give this form the appearance of *D. viridis*, but the substance is much more cartilaginous than in that species and the spines of *D. aculeata* are present, although not nearly so pronounced as in that species.

Cross sections of the larger branches show a structure intermediate between that of the two species mentioned. The *D. intermedia* P. & R. seems to be made up of this form as Agardh pictures it and other forms of *D. aculeata*. Postels and Ruprecht (1840, p. 13) mention a variety *teretifolia* as occuring at Sitka and another variety, *fuscescens*, as occurring on the Alaskan Peninsula. The former seems likely to be the same as our plant, but the latter is less likely to be placed here; probably to be placed rather with the type of *D. aculeata*. Kuetzing's figures (1859, pl. 96) of *D. intermedia* are evidently not of this form, nor is the *D. media* of the same author (loc. cit., pl. 95), but the *D. hybrida* (loc. cit., pl. 93) may possibly be. The f. *media* certainly needs more study and particularly the young plants, none of which are available to us.

Desmarestia ligulata (Lightfoot) Lamouroux.

In ten fathoms of water. Burrard's Inlet, B. C., *Harvey* (1862, p. 164).

Harvey says that the type and var. *herbacea* were found in the same locality. Very few, if any, of the plants which we have been able to examine correspond to the slender form from European localities which may more properly stand for the type, but are to be counted under the following form. The variation of width in this species and the distinctness of the veining, is very great, at least as far as the plants of the Pacific Coast of North America are concerned.

Desmarestia ligulata f. herbacea (Turner) J. Agardh.

Northwest coast of North America, *Turner* (1809, p. 77, pl. 99, under *Fucus herbaceus*); Norfolk Sound (near Sitka), Alaska, *Postels and Ruprecht* (1840, p. 13, under *Desmia herbacea*); Burrard Inlet, B. C., *Harvey* (1862, p. 164); Oak Bay, Victoria, B. C., *Tilden*, No. 244!; Port Renfrew, B. C., *Butler and Polley*, No. 7; west coast of Whidbey Island, Wash., *N.L.G.*, Nos. 85!, 120!

This form is plentiful in the region of Puget Sound, but is apparently rarer to the northward. It varies very much in width. One of us (W.A.S.) has noted it at Esquimalt, B. C., cast ashore in fragments several meters long and full 30 centimeters wide.

These plants are the widest we have ever seen or found mentioned. This form grows in abundance on the coast of Central California, but while reaching a considerable width, the plants are seldom over 8 or 10 centimeters wide.

Family DICTYOSIPHONACEÆ.

Dictyosiphon hippuroides (Lyngbye) Kuetzing.

On rocks, lower litoral zone. St. Paul Island, Alaska, *Greeley and Snodgrass*! (Setchell, 1889, p. 591); near Iliuliuk, Unalaska, Alaska, *W.A.S. and A.A.L.*!

Dictyosiphon fœniculaceus (Hudson) Greville.

On stones, middle and lower litoral zone. Alaska, *Harvey*, (1872, p. 463); west shore of Amaknak Island, Bay of Unalaska, Alaska, *W.A.S. and A.A.L.*, No. 3275!; Unga, Alaska, *A.A.L.*, No. 5049!; Shumagin Islands, Alaska, *Saunders*, (1901, p. 422); Uyak Bay, Kadiak Island, Alaska, *W.A.S. and A.A.L.*, No. 5091!; Prince William Sound, Alaska, *Saunders*, (1901, p. 422); Orca, Alaska, *W.A.S. and A.A.L.*, No. 5163!; Glacier Bay, Juneau, Wrangell, and Annette Island, Alaska, *Saunders*, (1901, p. 422).

Dictyosiphon fœniculaceus f. **Americanus** Collins.

Golofnin Bay, Alaska, *R. C. McGregor*, No. 5670!

Dictyosiphon Chordaria f. **gelatinosa** Stroemfelt.

On rocks or mud, in the middle and lower litoral zone. Dutch Harbor, Amaknak Island, Bay of Unalaska, Alaska, *A.A.L.*, No. 5008!; Friday Harbor, San Juan Island, Wash., *N.L.G.*, No. 212!

Family ELACHISTACEÆ.

Elachista lubrica Ruprecht.

On *Rhodymenia palmata* in the litoral zone. Prince William Sound, Alaska, *Saunders* (1901, p. 423); Orca, Alaska, *W.A.S. and A.A.L.*, No. 5156!; Yakutat Bay, Alaska, *Saunders* (1901, p. 423), and in Collins, Holden and Setchell, P. B.-A., No. 828!, *Rev. Albin Johnson*, No. 5717!; Glacier Bay and Wrangell, Alaska, *Saunders* (1901, p. 423).

Elachista fucicola (Velley) Areschoug.

On *Fucus vesiculosus*. Sitka, Alaska *Ruprecht*, (1851, p. 389).

The only reference is that of Ruprecht, who says in connection with *E. lubrica*: "Aus dem nördlichen stillen Ocean ist mir von dieser Gattung bisher nur *E. fucicola Aresch.* auf *Halidrys vesiculosa* von Sitcha bekannt."

Family CHORDARIACEÆ.

Myrionema strangulans Greville.

On various membranous algæ. On blades of Nereocystis, Cormorant Rocks, Uyak Bay, Kadiak Island, Alaska, *W.A.S. and A.A.L.*, No. 5131!, in Collins, Holden and Setchell, P. B.-A., No. 924!, under *M. vulgare*; on Ulva, Sitka, Alaska, *Saunders* (1901, p. 423); on *Hedophyllum sessile*, Victoria, B. C., *Tilden*, No. 356! under *Phycocœlis fecunda*; on Nereocystis, west shore of Whidbey Island, Wash., *N.L.G.*, No. 546!; on Ulva, East Sound, Orcas Island, Wash., *N.L.G.*, No. 529a!

Eudesme virescens (Carmichael) J. Agardh.

Not uncommon on rocks and eel grass in the litoral and sublitoral zones. Shumagin Islands, Prince William Sound, Glacier Bay, and Sitka, Alaska, *Saunders* (1901, p. 423).

Castagnea divaricata (Agardh) J. Agardh.

On mud flat, lower litoral zone. East Sound, Orcas Island, Wash., *N.L.G.*, Nos. 483!, 566!

The habit and structure resemble very strongly those of this species as it occurs on the coast of New England, but the paraphyses have fewer cells. They do have, however, the much swollen end cell characteristic of this species.

Leathesia difformis (L.) Areschoug.

On algæ of various kinds and on rocks, in the litoral zone. Iliuliuk, Unalaska, Alaska, *W.A.S. and A.A.L.*!; Uyak Bay, Kadiak Island, Alaska, *W.A.S. and A.A.L.*, No. 5080!; Yakutat Bay, Sitka, Wrangell, and Annette Island, Alaska, and Victoria,

B. C., *Saunders* (1901, p. 423); west coast of Whidbey Island, Wash., *N.L.G.*, No. 284!; Tracyton, Kitsap County, Wash , *Tilden*, No. 243!, but the last specimen is so poor that it is scarcely determinable.

Mesogloia simplex Saunders.

On worn plants of *Chordaria abietina* Ruprecht. Sitka, Alaska, *Saunders* (1901, p. 423); Gonzales Point, Victoria, B. C., *Tilden*, No. 348 (fide *Saunders*, 1901, p. 424); Port Renfrew, B. C., *Butler and Polley*, No. 9!

This curious species needs farther study. We have seen only one specimen, communicated to us by Mr. Collins.

Mesogloia Andersonii Farlow.

On rocks in the lower litoral or upper sublitoral zone. Port Renfrew, B. C., *Butler and Polley*, Nos. 12 and 41; west coast of Whidbey Island, Wash., *N.L.G.*, Nos. 116!, 116A!, 468! and in Collins, Holden and Setchell, P. B.-A., No. 925!; San Juan Island, Wash., *Tilden*. No. 349!, under *Chordaria flagelliformis*.

The plants of this species become very gelatinous very soon after they are taken from the water. Miss Tilden's plant has been referred here by Farlow and represents the typical structure of this species, but in our copy of the American Algæ the habit is dwarfed and somewhat less regularly pinnate than in the more typical specimens. Saunder's "*Liebmannia sp.*" (1901, p. 424, pl. 49) seems to us to belong to this species. His habit-figure resembles the habit of Miss Tilden's plant, while the structure agrees very well with that of the type. It was collected at Sitka, Alaska.

Chordaria flagelliformis f. typica Kjellman.

On rocks, upper sublitoral zone. St. Lawrence Island, Alaska, *Kjellman* (1889, p. 48); St. Paul Island, Alaska, *Greeley and Snodgrass*, Nos. 5797!, 5798!; near Iliuliuk, Unalaska, Alaska, *W.A.S. and A.A.L.*, Nos. 4027!, 5012!; Unga, Alaska, *A.A.L.*, Nos. 5048!, 5049!; Uyak Bay, Kadiak Island, Alaska, *W.A.S. and A.A.L.*, Nos. 5101!, 5082!; Yakutat Bay, Alaska, *Saunders* (1901, p. 424), *Rev. Albin Johnson*, No. 5715!; Glacier Bay and Sitka, Alaska, *Saunders* (1901, p. 424).

All the plants mentioned above which have been seen by us belong to this form, the only difference between them being in thickness. Some are very much more robust than others. For some unexplained reason this species seems to be restricted, on our coast, to the shores of Alaska, while on the eastern coast of North America it descends into very much warmer waters.

Chordaria flagelliformis f. **ramusculifera** Kjellman.

In the sublitoral zone. St. Lawrence Island, Alaska, *Kjellman* (1889, p. 48).

This form is near to, if not identical with, *C. flagelliformis* f. *densa* Farlow.

Chordaria flagelliformis f. **Chordæformis** Kjellman.

Upper sublitoral zone. Konyam Bay, Siberia, *Kjellman* (1889, p. 48).

Although this form does not quite enter our limits, it is mentioned here since the species mentioned above as *Myelophycus intestinalis* Saunders seems to come very near to it. The relationship at present seeming to exist between Chordaria, Myelophycus, and Analipus certainly needs more careful consideration and study, as will be emphasized farther under the next species.

Chordaria abietina Ruprecht. PLATE 18.

On rocks, at or just below low water mark. Dutch Harbor, Amaknak Island, Bay of Unalaska, Alaska, *R. C. McGregor*, No. 5692!; near Iliuliuk, Unalaska, Alaska, *W.A.S. and A.A.L.*, No. 4058!; Shumagin Islands, Alaska, *Saunders* (1901, p. 424); Cormorant Rocks, Uyak Bay, Kadiak Island, Alaska, *W.A.S. and A.A.L.*, No. 5132!; Prince William Sound and Sitka, Alaska, *Saunders* (1901, p. 424); Victoria, B. C., *Tilden*, No. 348!; Port Renfrew, B. C., *Butler and Polley*, No. 43!; Whidbey Island, Wash., *N.L.G.*, No. 31!

This species is probably not uncommon on the western coast of North America from just above Point Conception, California, to Unalaska, and even on to the Asiatic shores. The description must be amended in one important respect, and that is as regards the base. The base is not made up of a crust formed by the overlapping disks of a group of plants, but there is a distinct,

horizontal, lobed and parenchymatous thallus, from which many plants arise. The details are well shown in the series of figures of this species on plate 18. The figures are drawn from specimens from near Pacific Grove, California, where one of us had the opportunity of studying a very complete series of stages of growth. But evidence that these plants are not exceptional in this respect has been obtained elsewhere in California and on the Alaskan Coast. The existence of a similar horizontal thallus in *Chordaria flagelliformis* is suspected by us, at least in a more or less reduced state (cf., e.g., No. 482, P. B.-A., *C. flagelliformis* f. *densa* Farlow) and likewise in *Myelophycus cæspitosus* Kjellman, (according to Kjellman's figure, 1893, f. 1, and Okamura's specimen, 1899, No. 44). The horizontal thallus of *Analipus fusiformis* Kjellman seems very similar to that of *C. abietina*.

Analipus fusiformis Kjellman.

In the lower litoral zone, on rocks. St. Paul Island, Alaska, *Greeley and Snodgrass*, No. 5795!, *Townsend*, No. 5782! (Setchell, 1899, p. 591).

The plants included under the present species seem to agree with the description and figures of Kjellman's plant from Bering Island on the other side of the Bering Sea. The basal portion is not very conspicuous, but is as marked as in the type. Kjellman has placed this genus with *Cæpidium* J. Agardh in a special section of the family Chordariaceæ on account of the possession of a horizontal thallus, but, as shown above, this character is found also in *Chordaria abietina* and perhaps in other species as well as in *Myelophycus cæspitosus* Kjellman.

Family SPOROCHNACEÆ.

Carpomitra Cabreræ (Clem.) Kuetzing.

"Fuca Strait," B. C., *Harvey* (1862, p. 164).

Harvey says that Dr. Lyall collected a single specimen of this species in fruit, which agrees well with British specimens. It seems strange that none of the collectors in this region have seen it since.

Family RALFSIACEÆ.

Ralfsia verrucosa (Areschoug) J. Agardh.

On stones in the middle and lower litoral zones. Iliuliuk, Unalaska, Alaska, *W.A.S. and A.A.L.*, No. 4011!; west coast of Whidbey Island, Wash., *N.L.G.*, No. 192!

Both the plants placed under this species are sterile, but they seem otherwise to belong with this species rather than under either of the following.

Ralfsia deusta (Agardh) J. Agardh.

On rocks and stones middle and lower litoral zones. St. Lawrence Island and Port Clarence, Alaska, *Kjellman* (1889, p. 47); near Iliuliuk, Unalaska, Alaska, *W.A.S. and A.A.L.*, No. 4059! (sterile), *Postels and Ruprecht* (1840, p. 20, under *Padina deusta*); Kukak Bay, Orca, and Sitka, Alaska, *Saunders* (1901, p. 424).

Ralfsia clavata (Carmichael) Farlow.

On small stones in the middle litoral zone. Iliuliuk, Unalaska, Alaska, *W.A.S. and A.A.L.*, No. 4012!

The specimens noted here have fine unilocular sporangia and seem to agree well with this species.

Family LITHODERMATACEÆ.

Lithoderma fatiscens Areschoug.

On stones in the lower litoral and upper sublitoral zones. Port Clarence, Alaska, *Kjellman* (1889, p. 49); Iliuliuk, Unalaska, Alaska, *W.A.S. and A.A.L*!

The specimens are all sterile but the determination seems safe.

Lithoderma lignicola Kjellman?

On piles in the litoral zone. St. Michael, Alaska, *W.A.S.*, No. 5245x!

The specimens referred here are sterile, but they agree fairly well with Kjellman's description and figures (1883, p. 256, pl. 26, f. 8–11).

Family LAMINARIACEÆ.

Chorda filum (L.) Lamouroux.

On stones in the upper sublitoral zone. Safety Harbor, near Cape Nome, Alaska, *Newhall and Rhodes*, No. 5790!; Golofnin Bay, Alaska, *R. C. McGregor*, No. 5669!; St. Michael, Alaska, Herb. *D. C. Eaton*, No. 11!; Popof Island and Prince William Sound, Alaska, *Saunders* (1901, p. 424); Sitka, Alaska, *Postels and Ruprecht* (1840, p. 19, under *C. filum* var. *coriacea*); Strait of Juan de Fuca, B. C., *MacMillan* (1902, p. 219).

This species, which is common on the coasts of northern and northwestern Europe and the northeastern coasts of North America, is not abundant at any locality in our territory, so far as our present information is concerned. Ruprecht (1851, p. 368) says that it is probably plentiful in the Ochotsk Sea. Harvey (1872, p. 463) reports it from Alaska without specific locality. The locality farthest south is the one reported by Professor Conway MacMillan in the neighborhood of Puget Sound, but it is not at all plentiful.

Saccorhiza dermatodea (De la Pylaie) J. Agardh.

Although this species has been mentioned several times by the older writers, under the name of *Laminaria dermatodea*, there seems to be little doubt, but that some species of digitate Laminaria has been confounded with it in every case. It seems doubtful whether Harvey's *Laminaria dermatodea* (1862, p. 166) from the Strait of Juan de Fuca and from Esquimalt, B. C., can really be this species. J. G. Agardh refers Harvey's plant (1867, p. 18) to his *L. fissilis*.

Laminaria Bongardiana P. & R.

Saunders (1901, p. 429) says of this species, that it is abundant from Sitka to the Shumagin Islands, and gives as special localities, Kukak Bay, Prince William Sound, and Sitka. He does not separate the species into forms as Areschoug and Kjellman have done, and as we have attempted to do below. As we understand *L. Bongardiana*, it is a species with the habit and color of *L. digitata*, but with a circle of mucilage ducts in the outer cortex of the stipe, and with mucilage ducts in the blade just under the outer layers of cells.

Laminaria Bongardiana f. elliptica Kjellman.

On rocks, on exposed coasts, at low water mark. West shore of Amaknak Island, Bay of Unalaska, Alaska, *W.A.S. and A.A.L.*, No. 3245!, in Collins, Holden and Setchell, P. B.-A., No. XXVIII!; Orca, Alaska, *W.A.S. and A.A.L.*, No. 5155!; Yakutat Bay, Alaska, *Rev. Albin Johnson*!; Sitka, Alaska, *W.A.S. and A.A.L.*, No. 5203!

Kjellman has substituted this form name for Areschoug's form name *normalis*, and it has seemed best to follow him in it. Areschoug's plant probably came from Sitka (cf. Areschoug, 1883, p. 5). It is probably, also, the *palmata*-form of Postels and Ruprecht (1840, p. 10) from Kamtschatka

Laminaria Bongardiana f. **oblonga** Setchell and Gardner f. nov.

Differs from the preceding form in the narrower and undivided or only slightly divided blade, and from the f. *tæniata* in the obtuse or even slightly cordate base.

On timbers of a float. Sitka, Alaska, *W.A.S. and A.A.L.*, No. 5202a!

Laminaria Bongardiana f. bifurcata P. & R.

With the *f. elliptica*, when found growing. Near Iliuliuk, Alaska, *W.A.S.*! (specimen not preserved); floating, Unga, Alaska, *A.A.L.*, No. 5061a!

This is only a case of regeneration after an unusually deep split passing down from the blade into the stipe.

Laminaria Bongardiana f. tæniata (P. & R.) Kjellman.

With the f. *elliptica*, on rocks exposed to the waves, forming a fringe at low water mark. West shore of Amaknak Island, Unalaska, Alaska. *W.A.S. and A.A.L.*, No. 3245a!

This is simply a narrow, more or less undivided form with sharply cuneate base.

Laminaria Andersonii Farlow.

On rocks in the upper portion of the sublitoral zone. West coast of Whidbey Island, Wash., *N.L.G.*, Nos. 110a!, 275!

This species may be told from the other digitate species of our territory by the position of the circle of mucilage ducts which are

in the inner cortex, one-third to one-half way between the periphery and the medulla. No. 275 is a plant referred to *Eisenia arborea* by Saunders, a species not seen by us north of the central coast of California.

Laminaria Ruprechti (Areschoug) DeToni.

Sitka, Alaska, *Ruprecht*, (fide Areschoug, 1883, p. 4).

The proposer of this species had only a single specimen, and as far as we know, there have been no others found, or at least, identified. In looking over the description, we feel that it may be that *L. Ruprechti* is the same as our *L. bullata* f. *cuneata*, but since we have no opportunity of consulting the type-specimen, we must leave the disposition of our forms as given.

Laminaria fissilis J. Agardh.

This species evidently was founded on the *L. digitata* f. *partita* Postels and Ruprecht (1840, p. 10), a Kamtschatkan plant. The proposer says also that it includes the *L. dermatodea* of Harvey's List. From this, it appears that it occurs also on the shores of Vancouver Island at the Strait of Juan de Fuca. There seems to be some difference of opinion as to the occurence of mucilage ducts in the stipe. Kjellman says (1883, p. 236) that the stipe lacks these structures, while Rosenvinge (1894, p. 88) says that they are usually present in one or two circles. We have never seen any specimens certainly belonging to this species, but we suspect that we have forms of it under *L. bullata*. The latter species, however, has bullæ on the blade, which are not mentioned in any description of *L. fissilis*.

Laminaria nigripes J. Agardh.

Kjellman (1889, p. 45) has found this species on Bering Island, Siberia, and represented by several forms. We have not been able to determine exactly whether this species occurs in our territory or not, but we suspect that future study and comparison may result in transferring some, if not all, of the forms credited by us, and perhaps also by other authors, to the following species, from it to this one. They all differ from the descriptions of *L. nigripes*, however, in having bullæ on the blade.

Laminaria bullata Kjellman.

In the sublitoral zone. St. Lawrence Island, Alaska, *Kjellman* (1889, p. 46); Prince William Sound and Sitka, Alaska, and Puget Sound, *Saunders*, (1901, p. 428).

We have seen no authentic specimen of this species and can quote only the published references to it. We have a number of forms, decidedly diverse in habit and somewhat in structure, which we cannot refer elsewhere, and consequently, have placed them provisionally under form names connected with *L. bullata*, as follows.

Laminaria bullata f. **angusta** Setchell and Gardner f. nov.

Stipe short, 1–2 cm. long, terete or slightly flattened above. Blade 15–45 cm. long, 3–5 cm. wide, cuneate at the base, usually more or less falcate, with a row of deep bullæ within each margin. Mucilage ducts in the stipe in a dense circle close to the periphery, elongated radially and with conspicuous secreting cells; in the blade rather large, about one-third the way between the surface and the distinctly marked off and wide medulla.

Abundant in the upper sublitoral zone. West coast of Whidbey Island, Wash., *N.L.G.*, Nos. 109!, 124!, 158!. 681!

This is the plant figured by Kjellman (1889, pl. 2, f. 5) as an example of a young specimen from Bering Island. It does not seem to change its character with age and in general habit resembles the similar form of *L. saccharina*. It is never divided so far as our specimens go. The mucilage ducts in the stipe are sometimes scanty above, but are always more or less abundant below. Were it not for the very complete series of connecting forms, it would seem ridiculous to refer this form to a digitate species.

Laminaria bullata f. **subsimplex** Setchell and Gardner f. nov.

Stipe short, 4–8 cm. long, terete below, somewhat compressed above, stout. Blade 50–150 cm. long, 10–15 cm. wide, very dark and thick, usually with a more or less distinct row of bullæ within each margin, particularly in younger plants, commonly entire or split one-third or one-half the way down into two, or at most few and broad segments. Mucilage ducts in the stipe, forming

a dense circle just under the periphery; in the blade rather large, about half way between the surface and the distinctly marked off and wide medulla.

In the sublitoral zone. West coast of Whidbey Island, Wash., *N.L.G.*, Nos. 157b!, 159!, and in Collins, Holden and Setchell, P. B.-A., No. XXIX!

Near to the preceding, but a larger plant, with bullæ less marked or even absent, marking a transition to the broader and and distinctly digitate forms of the species.

We are inclined to refer Miss Tilden's No. 239, labelled *L. digitata*, from Port Renfrew, B. C., to this form, although only a portion of the plant is represented by the specimen distributed.

Laminaria bullata f. **cuneata** Setchell and Gardner f. nov.

Stipe short, 1–2 cm. long, soon very much flattened. Blade 45–90 cm. long, 10-25 cm. wide, sharply cuneate at the base, broadening out above, split into one to several broader or narrower divisions which usually extend to the very base, smooth for the most part. Mucilage ducts as in the last.

In the sublitoral zone, West coast of Whidbey Island, Wash., *N.L.G.*, Nos. 69!, 110b!

A form usually decidedly distinct from the preceding and approaching the following. This is the only form which practically entirely lacks the bullæ in the adult form.

Laminaria bullata f. **amplissima** Setchell and Gardner f. nov.

Stipe 2–4 cm. long, soon flattened. Blade 100–280 cm. long, 40–150 cm. wide, broadly cuneate to almost cordate at the base, broader above, split more or less deeply into few and broad segments, with a fairly distinct row of large bullæ within each margin. Mucilage ducts in the stipe in usually more or less incomplete circles just within the periphery; in the blade large, with conspicuous masses of secreting cells, one-third to one-half the way between the surface and the wide and distinct medulla.

On piles or floating wood in the upper sublitoral zone, in quiet water. Sitka, Alaska, *Ida M. Rodgers*, No. 5729!; Friday and Roach Harbors, San Juan Island, Wash., *N.L.G.*, Nos. 277!, 680!, 683?

The type of this form is No. 680 mentioned above. The plant is near to the preceding form, but while that is a plant of the exposed shores and consequently less ample, the present form is a plant of the more quiet waters where the opportunities are given to increase in width with the result that some of the plants are certainly gigantic for this species. In older plants the whole surface is bullate. No. 683 is a shorter, less ample plant with a distinctly cordate base with the mucilage ducts in the blade of moderate size and close under the surface, but with the marginal bullæ very distinct. With the exception of the bullæ it might pass very well for a specimen of *L. atrofulva* J. Agardh.

Laminaria dentigera f. **brevipes** Setchell and Gardner f. nov.

Stipe 10–15 cm. long, nearly cylindrical but somewhat flattened above: otherwise similar to the next.

Agattu Island, Alaska, *Townsend*, No. 5763!; Kyska Island, Alaska, *Townsend*, No. 5771!

The form described here agrees fairly well with Kjellman's figure (1889, pl. 2, f. 10) in habit and is fairly distinct from the following form which, however, seems also to belong under Kjellman's species. The stipe in f. *brevipes* is short and stout as compared with f. *longipes*, and not so noticeably compressed above. The whole plant seems thicker and denser. The mucilage ducts are present in the stipe in a dense circle just under the surface tissues, are elongated radially, and have clumps of secreting cells at the inner end. In the blade, the mucilage ducts are scanty, in fact we supposed at first that there were none present, but they are present and answer well to Kjellman's description.

Laminaria dentigera f. **longipes** Setchell and Gardner f. nov.

Stipe 25–50 cm. long, soon compressed, and above very decidedly flattened. Otherwise similar to the preceding.

On stones in the lower litoral and upper sublitoral zones. Unga, Alaska, *A.A.L.*, No. 5058!; Karluk, Kadiak Island, Alaska, *W.A.S.*, No. 5072!

This form looks very much like *L. digitata* f. *typica* with the cuneate base. The mucilage ducts in the stipe, however, distin-

guish it. The mucilage ducts in the blade appear to be somewhat more abundant than in the preceding form, but are not very common even here.

Laminaria digitata (L.) Lamouroux.

Laminaria stenophylla Harvey.

These species have been credited to our territory by the older writers, but it seems fairly certain that these species, as understood at present, are not known from our limits with any certainty.

Laminaria longicruris De la Pylaie.

This species is mentioned by Postels and Ruprecht (1840, p. 10) as being rare in the Northern Pacific Ocean. It has not been met with by any other writer.

Laminaria cuneifolia J. Agardh.

North Pacific Ocean, on the shores of Asia and America, *J. G. Agardh* (1867, p. 10); Popof Island, Alaska, *Saunders* (1901, p. 429).

We have seen the plant of Saunders, but do not feel certain of the determination. The species seems to be distinguished from *L. saccharina* chiefly by the mucilage ducts in the stipe, at least as Agardh has described it. From Saunders's description, his *L. saccharina forma a* (1901, p. 429), since it is said to have mucilage ducts in both stipe and blade, should be referred here. It is given a range from the Shumagin Islands to Wrangell, Alaska.

Laminaria solidungula J. Agardh.

In the sublitoral zone. Yakutat Bay, Kukak Bay, and Popof Island, Alaska, *Saunders* (1901, p. 429).

The present species has not occurred to us in the territory covered in this account. We have supposed at several times that we had discovered it, but the specimens have always proved to be young plants of *Cymathœre triplicata*, whose resemblance to *L. solidungula* at this stage is often very striking.

Laminaria longipes Bory.

Agattu Island, Alaska, *Townsend*, No. 5761!; Kyska Island, Alaska, *Townsend*, No. 5768!; St. Paul Island, Alaska, *Ruprecht*

(1851, p. 232), *Greeley and Snodgrass*, No. 5806! (Setchell, 1899, p. 591).

The present species resembles very strongly *L. Sinclairii* (Harvey) Farlow of the Central Californian coast in its habit and in its possession of a creeping rhizome, but differs from it in not having mucilage ducts in the stipe.

Laminaria saccharina (L.) Lamouroux.

Forms of the true *L. saccharina* are fairly abundant on the coast from Puget Sound to the Alaskan Peninsula. It is not known to enter the Bering Sea or to extend to the southward of Cape Flattery in Washington, a distribution which is puzzling from what we know of the species on the coasts of Europe or those of Eastern North America. The various older and modern references are fairly readily placed under the forms described, except the plants of Harvey (1862, p. 166) collected at Esquimalt, B. C.

Laminaria saccharina f. linearis J. Agardh.

On wood and stones, upper sublitoral zone. Unga, Alaska, *J. B. Downing*, No. 5788!; Uyak Bay, Kadiak Island, Alaska, *W.A.S. and A.A.L.*, No. 5136!; Kukak Bay and Prince William Sound, Alaska, *Saunders* (1901, p. 429, as to forma b only); Orca, Alaska, *W.A.S. and A.A.L.*, No. 5154!; Sitka, Alaska, *Postels and Ruprecht* (1840, p. 10, as to f. *cuneata* only), *W A.S. and A.A.L.*, No. 5202!; west coast of Whidbey Island, Wash., *N.L.G.*, Nos., 160!, 305!

Under this name we have included the narrower, thicker, less ruffled form with few or no bullæ. It seems to be a form of the colder waters or the colder seasons.

Laminaria saccharina f. membranacea J. Agardh.

On rocks and stones, or at times on other large algæ, in the upper sublitoral zone. Douglas, Alaska, *Eldred Jenne*, No. 649!; Sitka, Alaska, *Postels and Ruprecht* (1840, p. 10, under *L. latifolia*); Fairhaven, Wash., *N.L,G.*, No. 75!; Friday Harbor, San Juan Island, Wash., *N. L. G.*, No. 304!; Port Orchard, Kitsap County, Wash., *Tilden*, No. 240!

Both the preceding forms are included under the f. *normalis*

Setchell (1900, p. 122) and may perhaps be viewed as subforms or states under that form. We feel that perhaps it is well to separate and note them separately in this account, but we regard them as colder and warmer water states of the ordinary form of the species. Certainly in some waters the summer form of a plant would be placed under f. *membranacea* while the winter form of the same plant would be placed under f. *linearis*. Where the water is always cold, the species may possibly assume only the latter shape.

Laminaria saccharina f. **complanata** Setchell and Gardner f. nov.

Stipe long, up to 50 cm., terete below, soon flattened (20 mm. wide and 3 mm. thick about two-thirds the way up), without mucilage ducts. Blade 80–100 cm. long, 40–50 cm. wide just above the base, ample, ruffled, with base decidedly cordate. Mucilage ducts in the blade large and extremely abundant, just under the surface layer of cells.

Found in a single locality, growing on piles, in quiet water, just below low water mark. Friday Harbor, San Juan Island, Wash., *N.L.G.*, No. 682!

A very distinct form, easily recognized by its decidedly flattened stipe.

Hedophyllum sessile (Agardh) Setchell.

Attached to rocks in the middle and lower litoral zones. Yakutat Bay, Alaska, *Saunders* (1901, p. 429); Strait of Juan de Fuca, *Harvey* (1862, p. 167, under *Laminaria apoda*); Victoria, B. C., *Tilden*, No. 344! under *Laminaria sessilis*; Esquimalt, B. C., *W.A.S.*, No. 1877!; Port Renfrew, B. C., *Butler and Polley*, No. 60!; west coast of Whidbey Island and of San Juan Island, Wash., *N.L.G.*, No. 275!, etc.

The first description of this species was by C. A. Agardh (1824, p. 270), as from the southern seas. No more definite locality was known, until the identity between this species and the *L. apoda* of Harvey was established by J. G. Agardh. At present the species is known to range from Fort Ross, California, to Yakutat Bay, Alaska. *H. sessile* is the type of the genus and not *H. subsessile* as stated by Saunders (1901, p. 430). The

young plants have a short stipe, while the older plant becomes cucullate at the base of the blade, which sends out hapteres. This continues as the plant grows older, the blade continuing to expand at the base, to form new rows of hapteres, thus becoming more sessile and prostrate in this region, wider and more split above, until it forms clumps of sessile fronds sitting upon masses of clustered hapteres. The plants of the lower parts of its habitat have smooth blades, but those of the upper parts often have the blades bullate and irregularly rugose. The sori form indefinite patches over the base of the entire frond.

Hedophyllum subsessile (Areschoug) Setchell. Plate 20.

On rocks, usually forming a zone in the middle litoral zone. Kyska Island, Alaska, *Townsend*, No. 5770!; west shore of Amaknak Island, Bay of Unalaska, Alaska, *W.A.S. and A.A.L.*, No. 3286!, *L. E. Hunt*, No. 3250!, in Collins, Holden and Setchell, P. B.-A., No. xxvii!; Uyak Bay, Kadiak Island, Alaska, *W.A.S. and A.A.L.*, No. 5078!; Kukak Bay, Alaska, *Saunders* (1901, p. 430); Prince William Sound, Alaska, *Saunders*, No. 259!; Yakutat Bay, Alaska, *Saunders*, No. 218!; Puget Sound, *Saunders* (1901, p. 430).

The present species is widely diverse from any form which can be legitimately reckoned under *L. Bongardiana*, to which Areschoug referred it as a form. It comes near to *Hedophyllum sessile* in its earlier stages of growth, but soon departs from that species in that the central portion of the blade wears away, leaving the bases of the blade on each side of the original short stipe as thickened, rhizome-like, creeping structures bearing the blades, or half blades, at their tips (cf. pl. 20). The peculiar dying away of the center of the blade to the very base and the consequent thickening of the basal margins, is known in Eisenia (cf. Setchell, 1896) and in Thalassiophyllum as described below. The present species lacks the scrolls or auricles at the base of the blade characteristic of Arthrothamnus. The development of the members of the last genus is not known as yet, and may be quite different from that of Hedophyllum, if one may judge from specimens of the adult plants. While we have noted localities

for this species outside of Bering Sea, the plants are all young and do not show the characteristic rhizomes, and may be forms of *L. Bongardiana* or *L. bullata*.

Cymathære triplicata (P. & R.) J. Agardh.

On rocks and stones in the upper sublitoral zone. North Pacific Ocean, *Postels and Ruprecht* (1840, p. 10); Unalaska Alaska, *Ruprecht* (fide Areschoug, 1883, p. 20); west shore of Amaknak Island, Bay of Unalaska, Alaska, *W. A. S. and A. A. L.*, No. 3289!, in Collins, Holden and Setchell, P. B.-A., No. xxxiiia!; Shumagin Islands to Puget Sound, *Saunders* (1901, p. 430); Karluk, Kadiak Island, Alaska, *W.A.S.*, No. 5061!; Harvester Island, Uyak Bay, Kadiak Island, Alaska, *W.A.S. and A.A.L.*, No. 5118!; Orca, Alaska, *W.A.S. and A.A.L.*, No. 5177!; Yakutat Bay, Alaska, *Rev. Albin Johnson*, No. 5716!; Douglas, Alaska, *Eldred Jenne*, No. 648!; Victoria, B. C., *Tilden*, No. 343!; Esquimalt, B. C., *W.A.S.*, No. 1872!; west coast of Whidbey Island, Wash., *N.L.G.*, No. 88!, in Collins, Holden and Setchell, P. B.-A., No. xxxiiib!; Gardner also reports it from Port Townsend, Ludlow Bay, and Channel Rocks near Seattle, Wash.

A plentiful and very well marked plant when fresh, but not always so characteristic in herbarium specimens. No. 343 of Tilden's American Algæ seems to have a broad midrib similar to that of Pleurophycus instead of the usual triple fold, but this may be the result of too much pressure. When young or pressed too much, some plants may readily be taken for forms of *Laminaria solidungula*. So far as we know, the fruit of this species has never been described. No. 5177 shows an extended sorus at the base of the plant, but confined to one surface.

Pleurophycus Gardneri Setchell and Saunders.

On stones in the upper sublitoral zone. Yakutat Bay, Alaska, *Saunders* (1901, p. 427, pl. 52); west coast of Whidbey Island and near Port Townsend, Wash., *N.L.G.*, No. 882!; North Bay, San Juan Island, Wash., *Tilden*, No. 346!

The present very interesting and distinct genus of kelps has been well described by Saunders (loc. cit.) and by Setchell (1901, p. 123), and distributed by Miss Tilden as noted above.

Costaria Turneri Greville.

On rocks in the upper part of the sublitoral zone. Unalaska, Alaska, *Ruprecht* (1852, p. 26, under *C. quadrinervia*); Shumagin Islands, Kukak Bay, Prince William Sound, Yakutat Bay, and Sitka, Alaska, *Saunders* (1901, p. 431); Sitka, Alaska, *Postels and Ruprecht* (1840, p. 12); Puget Sound, *Bailey and Harvey* (1862, p. 160); Victoria, B. C., *Saunders* (1901, p. 431); Esquimalt, B. C., *Harvey* (1862, p. 166), *W.A.S.*, No. 1873!; Port Renfrew, B. C., *Butler and Polley*, No. 8; Whidbey Island and elsewhere throughout Puget Sound, Wash., *N.L.G.*, No. 87!, in Collins, Holden and Setchell, P. B.-A., No. XXXV!; Tracyton, Kitsap County, Wash., *Tilden*, No. 238! (under *C. Mertensii*).

So far as we know, the genus Costaria contains a single species, the differences between *C. Turneri* and *C. Mertensii* being unstable. *C. quadrinervia* Ruprecht is probably to be added, although we searched carefully at Unalaska for such a form without success, and, consequently, must judge from the description alone. It was first collected by Menzies and described by Turner (1819, pl. 226) as *Fucus costatus*. By a curious slip, Turner says on p. 72, "on the western coast of South America," while on p. 73, he says, "Habitat in occidentalibus Americæ Septentrionalis littoribus".

Agarum Turneri Greville.

On rocks in the sublitoral zone, usually found cast ashore. St. Lawrence Island, Alaska, *Kjellman* (1889, p. 43); St. Paul, Alaska, *Ruprecht* (1851, p. 244), *Greeley and Snodgrass*, No. 5794!, (Setchell, 1899, p. 592); Captains Bay, Unalaska, Alaska, *W.A.S. and A.A.L.*, No. 4088!; Unalaska, Alaska, *Postels and Ruprecht* (1840, p. 12, under *A. pertusum*, p. 11, under *A. Gmelini*); Popof Island, Kukak Bay, Prince William Sound, and Yakutat Bay, Alaska, *Saunders* (1901, pp. 430, 431, under *A. Turneri* and *A. Gmelini*); Unga, Alaska, *A.A.L.*, No. 5057!, *J. B. Downing*, No. 5787!; Harvester Island in Uyak Bay, Kadiak Island, Alaska, *W.A.S. and A.A.L.*, No. 5111!; Kadiak Island, Alaska, *Postels and Ruprecht* (1840, p. 12, under *A. brassicæforme*); Yakutat Bay, Alaska, *Rev. Albin Johnson*, No. 5178!; Sitka, Alaska, *Postels and Ruprecht* (1840, p. 12, under *A. platyneuron*).

A considerable study of various forms of Agarum, both on the eastern and western coasts of North America, has led us to the conclusion that the five species or forms enumerated and described by Postels and Ruprecht all belong to one and the same species as indicated above. They all seem to possess a stipe which is cylindrical or nearly so and scrolls at the base of the blade, two characters which distinguish them from the next species.

Agarum fimbriatum Harvey.

On stones or piles, from just below low water mark into water of 10–16 fathoms depth. Esquimalt, B. C., *Harvey* (1862. p. 166); west coast of Whidbey Island, Wash., *N.L.G.*, No. 84!; Friday Harbor, San Juan Island, Wash., *N.L.G.*, No. 678!; Tracyton, Kitsap County, Wash., *Tilden*, No. 345!

This species seems amply distinct from any other Agarum that has been described. It has a very much flattened, rather short stipe which becomes fimbriate with haptere-like outgrowths. The base of the blade has no scrolls as in the preceding species and which we have considered a characteristic of the genus. The margins are peculiarily crispate. It seems to be common in Puget Sound, and has not been found elsewhere, except three specimens which were found cast ashore at San Pedro, California, by Mrs. H. D. Johnston. How it came to be so far south of its hitherto only known district is one of those puzzles of distribution which are extremely difficult to solve.

Thalassiophyllum Clathrus (Gmelin) P. & R.

On rocks, forming a zone at low water mark. Agattu Island, Alaska, *Townsend*, No. 5762!; Kyska Island, Alaska, *Townsend*, No. 5772!; St. Paul Island, Alaska, Herb. *D. C. Eaton*! (Setchell, 1899, p. 592); Amaknak Island, Bay of Unalaska, Alaska, *Postels and Ruprecht* (1840, p. 11), *W.A.S. and A.A.L.*, No. 3246!, and in Collins, Holden and Setchell, P. B.-A., No. XXXVI!; Sitka, Alaska, *Postels and Ruprecht* (1840, p. 11).

This large and striking plant seems to be characteristic of Bering and Ochotsk Seas. The single locality of Sitka, as given by Postels and Ruprecht, exists outside of these, but the locality is doubtful, for Mertens (1829, p. 49) says that he did not see this species until he came to the Bay of Unalaska. It is evidently

a species of the very cold and rough waters. On the Island of Amaknak, it grows in great abundance and was found in all stages of growth. The earliest fronds are ovate and with short stipes. Later they become broadly reniform and begin to roll in at the edges on both sides of the stipe, looking very much like a young *Agarum Turneri* in this stage. The scrolls thus formed become more pronounced, perforations appear, and the central portion of the frond begins to erode and wear away, until finally there are left the much enlarged and thickened, perforated scrolls which wear away on one edge (the inner) and continue to unroll on the other. As they continue to grow, the basal portion of each scroll becomes a sort of stipe and the young plant is plainly dichotomous. As the plant grows on and branches in the irregular manner described by Rosenthal (1890, p. 140, f. 33, 34), this basal dichotomy becomes inconspicuous, and does not seem to have attracted attention before. Its peculiar origin is similar to the process which takes place in Eisenia and in *Hedophyllum subsessile* as mentioned above.

Arthrothamnus bifidus (Gmelin) Ruprecht.

Aleutian Islands, Alaska, *Areschoug* (1884, p. 14).

We know nothing of the occurrence of this species of the Ochotsk Sea and of Bering Island within our territory, farther than the reference quoted above.

Dictyoneuron Californicum Ruprecht.

Port Renfrew, B. C., *Tilden*, No. 519!

Apparently only just reaching the coast of Vancouver Island, certainly not abundant in Puget Sound. This is one of the common species at various localities on the central Californian coast.

Lessonia litoralis Farlow and Setchell.

Port Renfrew, B. C., *Tilden*, No. 342!, *Butler and Polley*, No. 50.

This species was first found on the coast of Oregon by E. Hall, mentioned by Farlow (1875, p. 355), and doubtfully referred to *L. fuscescens*. Later, the same author referred it to *L. nigrescens* (1876, p. 708), but on collecting good material at Monterey, California, he recognized it as new, but only gave it

a manuscript name. The species is common on exposed points in the vicinity of Monterey, where it has been collected by numerous botanists. The name, as given above, was first published and the species was first described by Miss Tilden in her American Algæ (Century IV, 1900). A full description and figures have been given by MacMillan (1900). The blades are of two sorts, the sterile being narrow and with a distinct midrib, while the fertile are broader, plane, and gladiate. On account of this very marked dimorphism, Reinke (1903) has just made it the type of a new genus which he has named Lessoniopsis.

Postelsia palmæformis Ruprecht.

On rocks on exposed points. Strait of Juan de Fuca, B. C., *MacMillan* (1902, p. 213).

This locality marks the most northern limit of this species, which ranges south from this point to Point Sur on the coast of California. It is locally known as the "Sea Palm," and is to be found in small forests or groves, at or near high water mark where the waves are strongest.

Nereocystis Luetkeana (Mertens) P. & R.

On stones, in the sublitoral zone, reaching its full development in 10–12 fathoms of water. Plentiful in the attached condition, from the Shumagin Islands to the region of Santa Barbara Channel on the coast of California. Shumagin Islands, Alaska, *Saunders* (1901, p. 431, under *Nereocystis Priapus*); Uyak Bay, Kadiak Island, Alaska, *W.A.S. and A.A.L.*, No. 5093!; Yakutat Bay, Alaska, *Rev. Albin Johnson*, No. 5720!; Esquimalt, B. C., *Harvey* (1862, p. 164); Port Renfrew, B. C., *Butler and Polley*, No. 39; west coast of Whidbey Island, Wash., *N.L.G.*, No. 686!; Port Orchard, Kitsap County, Wash., *Tilden*, No. 237!

The distribution of this species extends from the neighborhood of Point Conception, on the coast of Southern California, to the Shumagin Islands on the coast of Alaska. Beyond this point, it seems very unlikely that the species is to be found attached. It is, however, found cast ashore or floating. It comes ashore sparingly on the shores of the Bay of Unalaska, where one of us found it in the summer of 1899. It is found floating in masses of several acres in extent in the Bering Sea up

to the latitude of the Pribilof Islands. It is reported from the Pribilof Islands by Dall (1875, p. 166), but whether attached or floating is not stated. All along the Alaskan coast below Bering Sea, it is a very common object floating in the water in company with *Alaria fistulosa*, and one is warned of the approach to land by its appearance. It is said by Postels and Ruprecht (1840, p. 9) to be abundant at Sitka, rare at Iliuliuk, Unalaska, and to have been collected on the shores of Kamtschatka by Steller. This last is on the authority of Gmelin (1768, p. 231). Ruprecht, however, states (1852, p. 21) that Steller found the plant near Unalaska or near the Alaskan Peninsula. It has been credited to the Kurile Islands by Captain J. H. Snow (1897, pp. 42, 55, 60, etc.) but the description accompanying the statement shows that the plant observed was *Alaria fistulosa*. The plant has been used for various purposes, by the natives of the Northwest Coast. Ruprecht (1852, p. 21) says that the natives of Sitka place one end of the tube in the ear and the other against a hot stone to generate steam to cure cases of headache. The long solid and slender portion is used for fishlines, and the tube is used as a worm in the process of distilling "Hoochenoo," a dark and poisonous sort of whiskey.

Saunders has resurrected the specific name of Gmelin's *Ulva Priapus* for this species, stating that "Gmelin's figures and description of *Ulva Priapus* leave no doubt as to the identity of his plant." We feel that there is very considerable doubt as to the identity. Gmelin's figure shows nothing characteristic, and while the description is somewhat more explicit, it does not give sufficient data to determine whether Steller's plant is to be referred to Nereocystis or Pelagophycus. The locality whence the specimen came is also in doubt as mentioned above. By a process of exclusion, it may be possible to show strong probability that it is this species and not Pelagophycus, which also floats long distances. The doubt is sufficiently great, however, to prevent us from displacing a name which has been in universal use for over seventy years, even did we believe in choosing names for strict priority.

The histology and development of the species has been given in detail by MacMillan (1899).

Macrocystis pirifera (Turner) Agardh.

On stones, usually in from five to ten fathoms of water. Unalaska and Sitka, Alaska, *Postels and Ruprecht* (1840, p. 9); Sitka, Alaska, *Postels and Ruprecht* (1840, p. 9, under *Lessonia ciliata*), *Ida M. Rodgers*, No. 5727!; Juneau, Sitka, and Wrangell, Alaska, *Saunders* (1901, p. 431); Esquimalt, B. C., *Harvey* (1862, p. 164); Port Renfrew, B. C., *Tilden*, No. 518!; west coast of Whidbey Island, Wash., *N.L.G.*, No. 86!

The long Bladder Kelp is not uncommon on the western coast of North America from somewhere in the neighborhood of Magdalena Bay in Lower California up to the Strait of Juan de Fuca. It does not seem to be plentiful in Puget Sound, itself, or to the north, and it is doubtful as to whether it grows beyond Sitka, Alaska. It may have floated into Unalaska, but it seems certain that it does not grow there, at least on the side of the Bering Sea. The species is found floating to the south of Unalaska in the open ocean. Why the species does not extend farther to the north is certainly a query. It cannot be a matter of too low temperature, since what appears to be the very same plant grows down into the Antarctic waters of much lower temperatures than those of Bering Sea. The sori are supposed to appear only on the bladderless radical leaves, but in specimens from Peru, we have seen sori on leaves near the tip and provided with bladders. Saunders (1901, p. 431) speaks of this species as being confined to the elitoral zone, but we have never seen it growing in over 12 or 15 fathoms of water.

Eisenia arborea Areschoug.

"A broken fragment of this plant was obtained at Wrangell, and several specimens were obtained in Puget Sound," *Saunders* (1901, p. 431).

It certainly seems as if the recording of this plant within our limits must be founded upon an error of determination since the species is not known to grow north of San Pedro, California, and in every way it has the appearance of being a characteristic member of the subtropical region. A plant collected at Whidbey Island was determined by Saunders as being Eisenia, but a careful examination shows it to be *Laminaria Andersonii*.

Egregia Menziesii (Turner) Areschoug.

On rocks, lower litoral and upper sublitoral zones. Nootka Sound, Vancouver Island, B. C., *Menzies* (Turner, 1808, p. 57, pl. 27, under *Fucus Menziesii*); Port Renfrew, B. C., *Butler and Polley*, No. 72; Esquimalt, B. C., *Harvey* (1862, p. 164, under *Phyllospora Menziesii*); Victoria, B. C., *Tilden*, No. 236!; Puget Sound, *Bailey and Harvey* (1862, p. 160); west coast of Whidbey Island, Wash., *N.L.G.*, No. 48!

These localities probably mark the northern limit of this species. Hence it ranges south to the neighborhood of Point Conception, below which its place is taken by *E. lævigata* Setchell.

Pterygophora Californica Ruprecht.

On rocks, upper litoral zone. Port Renfrew, B. C., *Tilden*, No. 520!, *MacMillan* (1902a, p. 726); west coast of Whidbey Island, Wash., *N.L.G.*, No. 70!

This species seems to be abundant on exposed coasts on Puget Sound and reaches a considerable size, as indicated by MacMillan. Specimens fully as large, however, have been collected at Duxbury Reef in Marin County, at Carmel Bay in Monterey County, and at San Pedro in Los Angeles County, California. It seems, therefore, that MacMillan's assumption that Pterygophora reaches its maximum development along the British Columbian coast can hardly be substantiated. As to the relationship of the genus, we cannot hold with MacMillan that it may belong either to the "Laminarieæ or the Alariideæ," but must perforce belong to the latter because of the method of formation of the sporophylls. The possession of rings in the stipe and the hapteres and the fact that the sori do not cover the sporophylls completely, seems to us of little importance in this matter, since in undoubted species of Alaria, there may be rings in the stipe, at least, and in many cases, the sori do not cover the sporophylls completely. In Pterygophora the sporophylls are less determinate in their growth, but this is only of generic importance. We find ourselves in agreement with MacMillan as to the absence of mucilage ducts in the stipe and the presence of large ones in the blade.

Alaria esculenta (L.) Greville.

Arctic Coast of Alaska, *Harvey* (1872, p. 463); from Kamtschatka to Sitka, Alaska, *Postels and Ruprecht*, (1840, p. 11).

The references quoted refer to this species in the old general sense before the majority of the species at present described under the genus had been proposed, or, at least, accepted. In all probability both these references include several, or, at least, other species than *A. esculenta*. We have been inclined to be conservative in reckoning specific distinctions in this genus, but find that we must present a very tentative enumeration. Professor Kjellman has very kindly named a selected series of specimens sent to him and we have used his suggestions and notes, even farther than it is possible to state in each particular case.

Alaria Pylaii (Bory) Greville.

On stones in the lower litoral and upper sublitoral zones. Karluk, Kadiak Island, Alaska, *W.A.S.*, No. 5073!; Orca, Alaska, *W.A.S. and A.A.L.*, 5153!; Esquimalt, B. C., *Harvey* (1862, p. 165).

Kjellman is inclined to refer both the Alaskan numbers quoted above, to this species as represented by Greenland specimens and they certainly agree with specimens from Maine which we are disposed to refer to this species. Harvey's specimens are said by Saunders (1901, p. 425) to have been compared by Kjellman to the *A. fragilis* Saunders, which, in turn, seems to us to be little more than a young, long-stiped form of this species.

Alaria dolichorhachis Kjellman.

Agattu Island, Alaska, *Townsend*, No. 5753!

Two specimens, collected at the above mentioned locality, are said by Kjellman, to be near to this species, but still to be separated from it in all probability, while the specimens referred by one of us (Setchell, in Collins, Holden and Setchell, P. B.-A., No. XLI) doubtfully to this species are referred by him to *A. lanceolata* Kjellman.

Alaria tenuifolia Setchell.

Setchell, in Collins, Holden and Setchell, P. B.-A., No. XLV, 1901.

Stipe 16–60 cm. in length, cylindrical or nearly so only at the very base, much flattened above, slender and flexible; Rhachis more or less elongated, flattened, with the sporophylls at first remote, later crowded; Sporophylls from narrowly to broadly lanceolate and cuneate at the base, varying to broadly ovate or oblong and distinctly cordate at the base, with more or less pronounced stipes; Blade elongated, 100–150 cm. long, 10–35 cm. wide, broadly cuneate at the base, very thin, collapsing when withdrawn from the water, with plentiful cryptostomata of small size; Midrib narrow to fairly broad, oblong in cross section.

Not uncommon from Unalaska to Puget Sound.

The description applies to the species, in general, which is better understood if divided into at least two forms, as has been done below. The species is to be distinguished by its very decidedly flattened stipe and thin blade. Specimens from several localities were submitted to Kjellman, who replied that he considered it to be a distinct species belonging either to the group represented by *A. dolichorhachis-oblonga-elliptica* of Kjellman or by *A. membranacea-Pylaii-grandifolia* of J. G. Agardh.

We supposed at first that some, at least, of our specimens might represent forms of *A. grandifola*. This is particularly to be suspected as to the broader forms, while the narrower forms approach *A. Pylaii* and resemble also *A. fragilis* of Saunders. From both of the latter, our plants differ, as far as descriptions go, by the flattened stipe.

Alaria tenuifolia f. **typica** Setchell f. nov. Plate 22.

The type of the species is No. 3286a of Setchell and Lawson's collection on the west shore of Amaknak Island, Bay of Unalaska, Alaska, where the species formed a distinct zone on rocky shores below that of *A. lanceolata* and just above or just below the limits of extreme low water. The stipe is of moderate length, varying from 10 to 15 cm. as a rule, while the blade is comparatively narrow, 8–15 cm. in width, and cuneate at the base. The sporophylls are narrowly to broadly lanceolate with cuneate base and short stalks. The midrib is not noticeably broad.

On rocks and stones at low water mark. Amaknak Island,

Bay of Unalaska, Alaska, *W.A.S. and A.A.L.*, No. 3286a!, in Collins, Holden and Setchell, P. B.-A., No. XLV!; Juneau, Alaska, *W.A.S. and A.A.L.*, No. 5194!; Douglas, Alaska, *Eldred Jenne*, No. 646!

Alaria tenuifolia f. **amplior** Setchell and Gardner f. nov.

The stipe varies from 10–60 cm. in length, is usually stouter than in the last, and is usually as much flattened. The sporophylls are broad-ovate to oblong and cordate, each with a conspicuous stalk. They are frequently very large, measuring 45 cm. in length and 25 cm. in width, with the sorus more or less orbicular and covering only the basal third or fourth. The blade is ample, 20–35 cm. in width and 100–150 cm. long, with the base generally distinctly cordate.

Attached to piles and boulders near low water mark. Esquimalt, B. C., *N.L.G.*, No. 645!, *W.A.S.*, No. 1875!; near Roach Harbor, San Juan Island, Wash., *N.L.G.*, Nos. 650!, 651!

Kjellman seems to think that this is distinct from *A. grandifolia* J. Agardh, of which it seemed to us to be possibly a smaller form.

Alaria crispa Kjellman.

Upper sublitoral zone. St. Lawrence Island, Alaska, *Kjellman* (1889, p. 37).

Known to us only from Kjellman's description and figures.

Alaria prælonga Kjellman.

On rocks, lower litoral zone. St. Paul Island, Alaska, *Townsend*, No. 5781!, (Setchell, 1899, p. 592); Harvester Island, Uyak Bay, Kadiak Island, Alaska, *W.A.S. and A.A.L.*, No. 5130!

The first number (5781) is referred to this species by us and seems to be fairly typical, judging from specimens and plate. No. 5130 is said by Kjellman to belong to the same group of species, but differs from typical *A. prælonga* in the shape of the blade which is more abruptly attenuated toward the base and is broader than in the type. This species continues down to the Californian coast, where it appears in several forms. *A. curtipes* Saunders (1901a, p. 561, pl. 33) seems to us to belong to the form-cycle of this species.

Alaria laticosta Kjellman.

In the sublitoral zone in protected coves. Kukak Bay, Alaska, *Saunders* (1901, p. 425).

Saunders says that "Kjellman referred the plants sent him to this species with considerable doubt." Quoting Kjellman, he says:—"The form, color, and consistency of the blade, and the form, width and rigidity of the sporophyll differ somewhat from this species."

Alaria lanceolata Kjellman.

On rocks in the litoral and sublitoral zones. West shore of Amaknak Island, Bay of Unalaska, Alaska, *W.A.S. and A.A.L.*, No. 3249!, in Collins, Holden and Setchell, P. B.-A., No. XLI!; Glacier Bay and Sitka, Alaska, *Saunders* (1901, p. 426).

This species is, according to a report from Kjellman, the *A. dolichorhachis?*, distributed as No. XLI of the P. B.-A., but he adds that the blade is not so dark as in his specimens. We find, however, that in some of the specimens of that collection the blade is much darker than in the one sent for his inspection.

Alaria marginata P. & R.

Unalaska, Alaska, *Postels and Ruprecht* (1840, p. 11).

Besides the reference above, Harvey (1862, p. 165) has credited this species doubtfully to Esquimalt, B. C. Ruprecht (1851, p. 355) says that the species is rare and had occurred to him lately only from Fort Ross on the Californian coast. It is evidently a species with a broad solid midrib, a short cylindrical stipe, long and rather narrow sporophylls, and in most ways, as far as the incomplete description goes, resembling the *A. laticosta* of Kjellman.

Alaria fistulosa P. & R.

Gregarious, on rocks and stones, in the sublitoral zone. From the Kurile Islands and Northern Japan to the southeastern boundary of Alaska. For the species in general the following localities are recorded in our territory:—Unalaska Bay and Kadiak Island, Alaska, *Postels and Ruprecht* (1840, p. 11); Kukak Bay, Cook Inlet, Prince William Sound, Yakutat Bay, Glacier Bay, Juneau, and Wrangell, Alaska, *Saunders* (1901, p. 426).

This species takes the place of *Macrocystis* along the northern shores of our territory, in forming beds of kelp off rocky shores in waters of several fathoms depth. Its fronds are anchored and the stipe, bunch of sporophylls and much of the blade is submerged, but the long blade, reaching a length of 10–25 meters, rises to the surface and, buoyed up by the inflated midrib, generally floats for some distance on the top of the water. The plants are gregarious, and often form belts a longer or shorter distance from the shore as the Macrocystis does farther south. Like the Macrocystis and the Nereocystis, it is commonly met with floating and often in considerable quantity. While passing through Unimak Pass, between Bering Sea and the Pacific Ocean, the surface of the broad expanse of waters is commonly seen to be thickly covered with the floating blades of this species, and it was observed in fair abundance all along the coast of Alaska from the latitude of the Pribilof Islands in the Bering Sea to Wrangell Narrows in southeastern Alaska. It was carefully watched for to the south of the last mentioned locality, but no trace of it was seen. The species varies much, particularly in the width of the blade and shape of the sporophylls. As these plants are of different habitats, it has seemed best to enumerate the specimens actually examined and observed growing, under the forms described below. The stipe of this species seems to be free from mucilage ducts, but the blade in both forms possesses abundant structures of this kind, just under the outer layer of cells as Guignard has indicated (1892, p. 43).

Alaria fistulosa f. stenophylla Setchell.

Blade narrow, usually not over 30 cm., with narrow midrib. Sporophylls usually short and more or less decidedly obovate.

Forming the greater portion of the growth in belts just off shore and isolated bunches in quiet waters of 5 to 10 fathoms. Kyska Island, Alaska, *Townsend*, No. 5769!; plentiful in the Bay of Unalaska, both on the shores of the Island of Unalaska and the shores of the Island of Amaknak, Alaska, *W.A.S.*, *A.A.L.*, *and L. E. Hunt*, Nos. 3273!, 4096!, and in Collins, Holden, and Setchell, P. B.-A., No. XLIII!; Harvester Island, Uyak Bay, Kadiak Island, Alaska, *W.A.S. and A.A.L.*, No.

5117!; Uyak Bay, Kadiak Island, Alaska, *W.A.S. and A.A.L.*, No. 5102!; Douglas, Alaska, *Eldred Jenne* No. 647!

The specimens noted above were all found growing attached except possibly (and probably) the last. The form is found floating along the whole extent of Alaskan coast from near Wrangell to the Pribilof Islands. It is the form commonly observed. Young specimens of this form, collected at Unalaska, show that the fistulose character of the midrib, appears very early in the course of development, since specimens with blades 15 cm., or less long, show it well developed.

Alaria fistulosa f. platyphylla Setchell.

Blade broad, usually 60–90 cm. broad, midrib very much inflated and broad. The sporophylls are numerous, often as many as 90 or 100 on each side of the rhachis, are long and narrow, generally being linear-lanceolate in shape, 30–50 cm. long and 3–6 cm. wide.

Growing in deep water, usually found floating or cast ashore. Deeper parts of the Bay of Unalaska, Unalaska, Alaska, *W.A.S., A.A.L., and L. E. Hunt*, No. XLII in Collins, Holden and Setchell, P. B.-A!; seen floating in a number of localities in the Gulf of Alaska.

The present form seems to be an inhabitant of deep waters and is usually found floating or cast ashore. A single complete specimen cast ashore at Iliuliuk, Unalaska, Alaska, was found to measure somewhat over 25 meters in length, over 1 meter in width, with a large bunch of long sporophylls numbering about 200.

Alaria cordata Tilden.

Attached to rocks, lower litoral and upper sublitoral zones. Yakutat Bay, Alaska, *Saunders* (1901, p. 426); Port Renfrew, B. C., *Tilden*, No. 241b!; San Juan Island, Wash., *Tilden*, No. 241a!

The species noted above is known to us from a young specimen (Tilden, No. 241a), a couple of sporophylls (Tilden, No 241b) and the figure of Saunders (1901, pl. 56). There seems to be no character to separate it from *A. Pylaii*.

Alaria fragilis Saunders.

In the sublitoral zone. Kukak Bay, Prince William Sound, and Glacier Bay, Alaska, *Saunders* (1901, p. 425).

It certainly seems to us that this plant is likely to prove to be nothing more than a variety of *A. Pylaii* with a somewhat elongated stalk, such as certainly does occur among plants of that species. The distant sporophylls as well as their shape is due to the youth of the plant.

Alaria fragilis f. **bullata** Saunders.

With the last. Glacier Bay, Alaska, *Saunders* (1901, p. 425).

Apparently only a state of the last.

Alaria valida Kjellman and Setchell sp. nov. Plate 21.

Stipe short, 1–5 cm. long, cylindrical, at first slender, but at length stout and showing rings of growth, reaching a diameter of 13 mm., showing also a well developed cork layer. Rhachis at first short, becoming very much elongated, up to 15–20 cm., somewhat flattened, obtuse on the edges, stout like the stipe. Sporophylls linear lanceolate, 15–50 cm. long and 3–6 cm. wide, with margins undulate and all except the narrow margins and a small portion of the tip occupied by the sorus. Blade long, up to 3–4 meters, 15–25 cm. wide, tapering very gradually to the base, with broad midrib (22 mm. wide), which is little prominent and abruptly narrowing towards each end in cross section.

This belongs to the group of species with broad midribs and is fairly nearly related to *A. laticosta* Kjellman, but differs from that species chiefly in the stouter stipe and rhachis and the longer and broader sporophylls. Its relation to *A. marginata* P. & R. is still to be settled.

In the sublitoral zone. Unga, Alaska, *A.A.L.*, No. 5059!; west coast of Whidbey Island, Wash., *N.L.G.*, No. 111!

Specimens of the above collections were sent to Professor Kjellman, who recognized them as belonging to a new species. We have drawn up the description and given the name to the plant on account of the broad stipe and rhachis. In the type, the stipe is short, but in the following form it is much longer.

Alaria valida f. **longipes** Setchell and Gardner f. nov.

Stipe long, 8–20 cm. in length, not including any of the rhachis. Otherwise as in the type.

With the typical form on the west coast of Whidbey Island, Wash., *N.L.G.*, No. 111!

A few specimens from the west coast of Whidbey Island, growing on the same rocks with the typical form, show such pronouncedly longer stipes from the majority of the specimens that it seems necessary to call attention to them under a separate form name.

Family DICTYOTACEÆ.

Dilophus flabellatus Collins.

Washed ashore. Sackman's Point, near Tracyton, Kitsap County, Wash., *Tilden*, No. 335!, under *Dictyota dichotoma* f. *latifolia*.

This has been compared with the plant of Collins (in Collins, Holden and Setchell, P. B.-A., No. 834, 1901) both by Collins, and ourselves. It seems to certainly be the same. It, as well as the cotype cited, does not show the Dilophus-structure in all parts and it may be doubted as to whether Dilophus is really distinct from Dictyota and also as to whether *D. flabellatus* is really distinct from *Dictyota Binghamiæ* of J. G. Agardh. It seems distinct, but farther study and comparison is needed. However, it is a strange matter of distribution to find a plant, hitherto known only from Southern California and distinctly subtropical, in this northern locality. It may be that there will be found other warm water species in the inland and shallower portions of Puget Sound. Miss Tilden has kindly informed me that, in her opinion, this plant must have grown near the place where it was found, "for it came up in large quantities and at all times on the incoming tide". The only other collection of this species, north of Santa Barbara, California, known to us, was made by one of us at Monterey, California, near the steamboat wharf, shortly after the arrival of a steamer from Southern California.

Family FUCACEÆ.

Fucus inflatus (L.) Vahl.

The present species has been the subject of considerable research on the part of the Scandinavian Algologists and the latest study is contained in the very recently issued work of Börgesen (1902, pp. 465–472). The account of Börgesen seems to the writers to deal most satisfactorily with the forms of the west coast of North America usually included under the name of *Fucus furcatus* Agardh and will consequently be followed by us. The form usually classified under Agardh's name does not agree with the type figure (Agardh, 1821, pl. 14), which is a smaller and less perfectly developed plant, as Börgesen has pointed out (loc. cit., p. 465), and a transitional form between two distinct forms.

Fucus inflatus f. edentatus (De la Pylaie) Rosenvinge.

Attached to rocks at low water mark. Victoria, B. C., *Tilden*, No. 234, under *F. furcatus*!; west coast of Whidbey Island, Wash., *N.L.G.*, No. 91!

No. 91 is a large broad typical plant, agreeing well in every character with the *F. edentatus* of the New England coast. No. 234 is still typical but not quite so well developed. The type of *F. furcatus* seems to represent a dwarfed and not symmetrically developed form and is said by Agardh to have been collected at Unalaska by Chamisso. One of us has searched very carefully in the region of the Bay of Unalaska for it, but has failed to find any trace of it, and Ruprecht (1851, p. 346) says that the original specimen came, not from Unalaska, but from Fort Ross in California where it is common. Kuetzing's figure (1860, pl. 17, II), which is seemingly from the original material of *F. furcatus*, although small, is typical of the *edentatus* form. Harvey (1862, p. 163) refers specimens from Esquimalt doubtfully to *F. furcatus*.

Fucus inflatus f. linearis (Œder) Rosenvinge.

Fairhaven, Wash., *N.L.G.*, No. 189!

To this form, we have referred some specimens which agree fairly well with the preceding form, but are much narrower. The plants are about 15 cm. high and 3 mm. wide, while the

plants of the preceding form which represent the typical form, are 30–45 cm. high and 6–10 mm wide. The narrowness of the frond and the acute angles between the fairly regularly dichotomous branches give it a very distinct appearance. It represents a distinct transition from the preceding to the following.

Fucus inflatus f. **filiformis** (Gmelin) Setchell and Gardner f. nov.

This seems to be the *F. filiformis* of Gmelin, or at least what has passed under that name on the coast of New England. The plants are 8–10 cm., even at times 15 cm., high and seldom over 1–2 mm. wide. While the midrib is distinct in some plants or in some parts of others, as a rule the main portion of the frond is reduced to the thickened midrib portion itself without alæ. The receptacles are fairly broad in proportion to the sterile portion of the frond.

On sand rocks, uppermost litoral zone. Fairhaven, Wash., *N.L.G.*!

An extreme form as regards the slender character of the frond, and it also has a tendency to spread out and become more flabellate in its dichotomy. Somewhere under *F. inflatus* is probably to be referred the *F. Miclonensis* mentioned by J. G. Agardh (1870a, p. 35) as occurring at Vancouver Island, B. C.

Fucus evanescens Agardh.

The type of the present species came from Kamtschatka and the species itself is well developed in the region of the North Pacific as well as in the North Atlantic. As a rule it is easily recognized in its broader forms, by its habit, and by the midrib vanishing below the tips of the branches. It approaches in some of its forms to *F. platycarpus* Thuret, and one of us has been inclined to refer some forms which had some indication of a more pinnate method of branching to the latter species. It seems best, however, to refer all the plants not distinctly belonging to the preceding species to *F. evanescens*. It is interesting to note that Börgesen (1902, p. 472) refers Thuret's species to *F. spiralis* L.

Fucus evanescens f. typica Kjellman.

On rocks, upper litoral zone. Harvester Island, Uyak Bay Kadiak Island, Alaska, *W.A.S. and A.A.L.*, No. 5122!

The specimens referred here are the only ones we have seen from our territory, which agree thoroughly with the plate of Agardh (1821, pl. 13).

Fucus evanescens f. limitatus Kjellman.

In the sublitoral zone. Port Clarence, Alaska, *Kjellman* (1889, p. 34); Besboro Island, Norton Sound, Alaska, *R. C. McGregor*, No. 5683!

We refer the plant from Besboro Island to this form with some considerable doubt, since there is only the description to guide us. In general shape and size of the frond, and shape of the receptacles, it seems to agree better than with any other form so far described.

Fucus evanescens f. rudis Kjellman.

On rocks in the sublitoral zone. Harvester Island, Uyak Bay, Kadiak Island, Alaska, *W.A.S. and A.A.L.*, No. 5121!

As we understand this form, it differs from f. *typica* by its narrower, more linear frond, and more pointed receptacles. It grew near the plants referred to the typical form, but in a distinct patch, with a somewhat different aspect.

Fucus evanescens f. macrocephalus Kjellman.

On stones, upper litoral zone, in quiet waters. Cape Dyer, Alaska, *Newhall and Rhodes*, Nos. 5791!, 5792!; east shore of Amaknak Island, Bay of Unalaska, Alaska, *R. C. McGregor*, No. 5689!, *W.A.S. and A.A.L.*, No. 4077!; Shumagin Islands, Kukak Bay, Cook Inlet, Prince William Sound, and Glacier Bay, Alaska, *Saunders* (1901, p. 432); Skaguay, Alaska, *A. L. Bolton*! (young); Sitka, Juneau, Wrangell, and Annette Island, Alaska, *Saunders* (1901, p. 432); Whidbey Island, Wash., *N.L.G.*, No. 89!; Tracyton, Kitsap County, Wash., *Tilden*, No. 235!

Some of the specimens quoted above are referred here with doubt, but the greater part of them agree well with Kjellman's description and with the plate of Saunders (1901, pl. 72, f. 1).

Fucus evanescens f. **robustus** Setchell and Gardner f. nov.

Caulescent with the stipe stout and erect, 15–18 cm. high, broad above, 2–2.5 cm. wide, midrib narrow and distinct to just below the apices, with broad oblong ovate or obcordate, short, flat, margined receptacles.

St. Paul Island, Alaska, *Greeley and Snodgrass*, No. 5805! (cf. Setchell, 1899, p. 593, under *F. platycarpus?*); Sitka, Alaska, *Ida M. Rodgers*, No. 5724!

The type is No. 5724, from Sitka. The form resembles the last, but is more robustly caulescent, the foliaceous portion is thicker, while the receptacles resemble those of typical *F. platycarpus* Thuret, from which it is to be distinguished by its lack of strongly pronounced pinnate habit. From f. *dendroides*, which it resembles in its arborescent habit, it is to be distinguished by the broader foliaceous frond and the broader receptacles.

Fucus evanescens f. cornutus Kjellman.

On rocks in exposed places, lower portion of the litoral zone. Popof Island, Kukak Bay, Prince William Sound, Yakutat Bay, and Juneau, Alaska, *Saunders* (1901, p. 432); Yakutat Bay, Alaska, *Rev. Albin Johnson*, No. 5719!; Esquimalt, B. C., *N.L.G.*, No. 625!, in Collins, Holden and Setchell, P. B.-A., No. 927!

To be distinguished by its forked, often swollen receptacles whose branches are pointed and horn-shaped. The form varies somewhat. No. 5719 is a very large plant, 30 cm. high and rather broad winged in the upper part for this form.

Fucus evanescens f. **longifructus** Setchell and Gardner f. nov.

Somewhat caulescent below, foliaceous above, up to 45 cm. high and 1–2 cm. wide, midrib not pronounced. Receptacles of various shapes from short, broad, blunt, and broadly obcordate to elongated and once or twice forked, with the divisions long, curved and pointed. These elongated receptacles give the characters of the form and reach a length of 15–18 cm.

On stones, upper and middle litoral zones in waters much mixed with glacial waters. Orca, Alaska, *W.A.S. and A.A.L.*, No. 5151!, in Collins, Holden and Setchell, P. B.-A., No. 928!; Juneau, Alaska, *W.A.S. and A.A.L.*, No. 5186!

Probably a state or form produced by the admixture of cold milky waters from the glaciers, and possessing characters intermediate between ff. *macrocephalus* and *rudis*, but those of the latter much exaggerated. The receptacles seem to continue growing at the tips after they have become more or less disassociated from the rest of the plant at their bases. In the Juneau specimens the receptacles are decidedly swollen.

Fucus evanescens f. contractus Kjellman.

On rocks in the litoral zone. St. Lawrence Island, Alaska, *Kjellman* (1889, p. 34); Golofnin Bay, Alaska, *R. C. McGregor*, Nos. 5673!, 5679!; St. Michael, Alaska, *W.A.S.*, Nos. 5238!, 5239!, 5252!

A narrow plant referred, as to other than Kjellman's plants, with some doubt.

Fucus evanescens f. dendroides Stroemfelt.

Agattu Island, Alaska, *Townsend*, Nos. 5755!, 5756!

The specimens referred here seem to agree well with Stroemfelt's description and figure (1886, p. 35, pl. 3). It is certainly a form of decidedly arborescent appearance, presumably erect in habit.

Fucus evanescens f. pergrandis Kjellman.

On stones near high water mark. Kyska Island, Alaska, *Townsend*, No. 5773!; east shore of Amaknak Island, Bay of Unalaska, Alaska, *W.A.S. and A.A.L.*, Nos. 3284!, 4049!, in Collins, Holden and Setchell, P. B.-A., No. XLVI!, under *F. platycarpus*; Yakutat Bay, Alaska, *Rev. Albin Johnson*, No. 5701!; Port Renfrew, B. C., *Butler and Polley*, No. 20!

A large, broad form with large, broad receptacles which are sometimes very flat or sometimes very considerably swollen.

Fucus evanescens f. angustus Kjellman.

On rocks in the lower litoral zone. Whidbey Island, Wash., *N.L.G.*, No. 76!; East Sound, Orcas Island, *N.L.G.*, No. 624!, in Collins, Holden and Setchell, P. B.-A., No. 926!

A narrow form to be compared with *f. contractus*, from which it seems to differ in aspect on account of its more regularly branched, linear frond.

Fucus evanescens f. nanus Kjellman?

Yakutat Bay, Alaska, *Rev. Albin Johnson*, No. 5712! (sterile).

A dwarf, slender, irregularly branched form, referred here doubtfully on account of its sterile condition.

Fucus evanescens f. bursiger (J. Agardh) Kjellman.

On rocks at extreme upper tide limit. Summer Bay, Unalaska, Alaska, *W.A.S. and A.A.L.*, No. 4052!; Dutch Harbor, Unalaska, Alaska, *R. C. McGregor*, No. 5689a!; Whidbey Island, Wash., *N.L.G.*, No. 90!

A depauperate form of the uppermost portion of the litoral zone, agreeing with the description and figure of J. G. Agardh (1870a, p. 35, pl. 3).

Under *Fucus evanescens* are probably to be placed the older references to the occurence of *F. vesiculosus*, a species lacking, in all probability, on our western coast. Most of the references state that the species is represented by the form without vesicles. The following are to be noted:

F. vesiculosus Postels and Ruprecht (1840, p. 12). Sitka, Alaska.

F. vesiculosus var. *minor* Harvey (1841, p. 134). Kotzebue Sound, Alaska.

F. vesiculosus Bailey and Harvey (1862, p. 160). Puget Sound.

F. vesiculosus var. *evesiculosus* Harvey (1862, p. 163). Esquimalt and Victoria, B. C.

F. vesiculosus Harvey (1872, p. 463). Kotzebue Sound, Alaska.

FAMILY SARGASSACEÆ.

Cystophyllum geminatum (Agardh) J. Agardh.

On rocks, in sheltered places, lower litoral and upper sublitoral zones. Bay of Morozof (Morzhovoi Bay), Alaska, *Townsend*, No. 5778!; Shumagin Islands and Kukak Bay, Alaska, *Saunders* (1901, p. 432, under *C. Lepidium*); Kadiak Island, Alaska, *Ruprecht* (1851, p. 348, under *Cystoseira thyrsigera*); Yakutat Bay, Sitka, and Wrangell, Alaska, *Saunders* (1901, p.

432, under *C. Lepidium*); Banks Island, B. C., *Harvey* (1857, p. 122); Victoria, B. C., *Saunders* (1901, p. 432, under *C. Lepidium*); in 14 fathoms, Esquimalt, B. C., *Harvey* (1862, p. 163); Port Renfrew, B. C., *Butler and Polley*, Nos. 19, 103; west coast of Whidbey Island, Wash., *N.L.G.*, No. 36!, in Collins, Holden and Setchell, P. B.-A., No. XLVII!, under *C. Lepidium*; Friday Harbor, San Juan Island, Wash., *Tilden*, No. 232!, under *C. Lepidium*.

Five species are quoted from the coasts ranging between the Ochotsk Sea and Puget Sound, viz., *Cystoseira geminatum* Agardh, *C. thyrsigera* P. & R., *C spicigera* Mertens and Agardh, *C. Lepidium* Ruprecht, and *C. hypocarpa* Kuetzing. It is questionable whether there are characters to separate them from one another and it has seemed necessary to place them all under one name for the present. *C. spicigera*, however, is said by Ruprecht (1851, p. 348) not to represent without emendation, any certainly known species, and consequently, although this name is the oldest, it seems best not to adopt it because of the uncertainty. From the descriptions and figures it certainly seems that *C. thyrsigera*, *C. Lepidium*, and *C. hypocarpa*, refer at least, to forms of the same species and are to be united. The identity of *C. thyrsigera* and *C. geminatum* rests on the authority of J. G. Agardh.

Cystoseira osmundacea (Menzies) Agardh.

Sannak Island, Alaska, *Turner* (1886, p. 85).

This is the only reference to this common Californian species as occurring within our limits. It is to be questioned as to whether it may not be the preceding species masquerading under this name.

RHODOPHYCEÆ.

The Rhodophyceæ of the Northwest Coast are more numerous than had been supposed until within a few years, and form a group which has taxed our efforts to the utmost. The abundant materials collected in our hands has presented to us a large number of problems of identification which we trust we have

either solved, or at least, have not left in such a condition as to confuse others. We have preferred here, as in the foregoing groups, to deal with what seem to be polymorphous species in many cases, and have adopted the method of naming forms to give definiteness to our ideas of the amplitude of variation. Our studies on the Californian Coast have helped us much in realizing the extreme variation which a species of algæ may undergo under circumstances of varying environmental conditions and still adhere to the general type. We have followed in general arrangement and largely in the selection of the generic names and generic distinctions, the work of Schmitz and his collaborators, Hauptfleisch and Falkenberg (1896–1897) in Engler and Prantl. In some cases, we have departed and have followed J. G. Agardh in his later arrangements of the genera formerly grouped under Delesseria and Callithamnion, and for good reason as it has appeared to us. We have also found much help on many groups from Kjellman's critical notes in the Algæ of the Arctic Sea (1883). For unravelling the difficulties in some genera, Ruprecht (1851) has been indispensable and Kuetzing's Tabulæ Phycologicæ have assisted greatly. In this group, particularly, which has been less thoroughly studied, it has been necessary to examine all the literature available in almost every case. We have derived very considerable information from Yendo's papers on Corallinæ Veræ (1902 and 1902a), although we cannot agree with him in the closeness of his specific distinctions.

We are indebted to M. Foslie of Trondheim, Norway, for the account of the crustaceous Corallinaceæ, and to Mr. F. S. Collins, and through him to Professor W. G. Farlow, for help in many cases of troublesome synonymy. To Mr. H. T. A. Hus, we are desirous of expressing our thanks for examining all of the material of the genus Porphyra and for the masterly way in which he has unravelled the difficulties of specific distinction in that genus.

As regards comparative distribution of the species of this large group, we are, as yet, hardly in a position to make any very general or explicit statements. A very considerable number of the species found in the North Temperate Region of the Pacific Coast of North America are continued into Puget Sound, and

even up to Sitka or Yakutat Bay, or farther on. There are, however, to be found in the vicinity of Puget Sound, many species characteristic of the Boreal Region which are not to be found farther to the south. Many more species of the North Atlantic are to be found in our territory than farther south along the coast, and, as we proceed northward, these species and those closely related to them form the characteristic portion of the flora. In the Upper Boreal, the North Atlantic and Arctic character is very pronounced, intermingled with some species characteristic of the Lower Boreal. Very little, however, is known, as yet, of the species of this region.

Family BANGIACEÆ.

Bangia atropurpurea f. fuscopurpurea (Dillwyn) J. Agardh.

On old wood of piles, floats, and wharves, in the litoral zone. Dutch Harbor, Amaknak Island, Bay of Unalaska, Alaska, *R. C. McGregor*, No. 5691!; Juneau, Alaska, *W.A.S. and A.A.L.*, No. 5199!; Victoria, B. C., *Saunders* (1901, p. 432, under *B. atropurpurea Pacifica*); Port Renfrew, B. C., *Tilden*, No. 333!, under *B. vermicularis*, *Butler and Polley*, No. 111; west coast of Whidbey Island, Wash., *N.L.G.*, No. 125!; Orcas Island, Wash., *N.L.G.*, No. 684!; Seattle, Wash., *N.L.G.*, Nos. 306!, 306a!; Pleasant Beach, Kitsap, County, Wash.. *N.L.G.*, No. 350!

This seems to be the only species yet collected within the limits of our territory, although we have kept careful watch for the *B. vermicularis* of the Californian coast. As yet no species has appeared which compares with that in coarseness of filament. The specimen distributed by Miss Tilden under *B. vermicularis* is slender even for f. *fuscopurpurea*. It seems to us somewhat doubtful, however, whether *B. vermicularis* is, itself, distinct from this species. J. G. Agardh (1882, p. 37) seems to have been inclined to separate the Californian form of *B. atropurpurea* as distinct, but evidently decided not to give it a different name, although the plate (loc. cit., pl. 1, f. 34–39) has the legend, *B. Pacifica*, while the explanation of the figures (loc. cit., p. 179) has the trinomial *B. atropur-*

purea Pacifica. We hardly think that Agardh intended to use either as a name for the Californian plant, but Saunders (1901' p. 432), however, has used the latter to designate a plant from Victoria, B. C., and without explanation.

Porphyra laciniata (Lightfoot) Agardh.

On rocks or on *Fucus evanescens* in the litoral zone, or even in the upper sublitoral zone. West shore of Amaknak Island, Bay of Unalaska, Alaska, *W.A.S. and A.A.L.*, Nos. 3269!, 3270!; Orca, Alaska, *W.A.S. and A.A.L.*, No. 5164!; Yakutat Bay, Alaska, *Saunders* (1901, p. 433), *Rev. Albin Johnson*, No. 14!; Sitka, Alaska, *Saunders*, No. 136!; Annette Island, Alaska, *Saunders*, No. 26!

So far as the data are accessible to us, the present species seems to be confined to the coasts of Alaska. In this, as in the following species, we have followed the account of Hus (1902) in the citation and distribution. *P. laciniata* is cooked by the Indians of Yakutat Bay and eaten. This is reported to us by Rev. Albin Johnson, and we have observed Yakutat Indians at Orca drying it, evidently for a food supply.

Porphyra laciniata f. umbilicalis Agardh.

St. Paul Island, Alaska, *Townsend*, No. 5780! (Setchell, 1889, p. 593).

Differs from the preceding chiefly in its well marked umbilicate base.

Porphyra perforata J. Agardh.

On rocks in the litoral and upper sublitoral zones. Shumagin Islands, Alaska, *Saunders*, No. 394!; Glacier Bay, Alaska, *Saunders*, No. 100!; Sitka, Alaska, *Saunders*, No. 130!; Victoria, B. C., *N.L.G.*, No. 318!; Esquimalt, B. C., *N.L.G.*, No. 322!; Port Renfrew, B. C., *Butler and Polley*, No. 45; west coast of Whidbey Island, Wash., *N.L.G.*, No. 97!; Orcas Island, Wash., *N.L.G.*, No. 295!; San Juan Island, Wash., *N.L.G.*, No. 286!

A very common species in the region of Puget Sound, but less so on the coast to the north. The species has been well defined and described by Hus (1902). As a rule the typical form is a

fairly large plant, but No. 322 is nearly 4 meters long and 1.5–2 meters wide, one of the largest of known Porphyras.

To this species are probably to be referred the plants mentioned under *P. vulgaris*, as follows: Esquimalt, B. C., *Harvey* (1862, p. 176) and Puget Sound, *Bailey and Harvey* (1862, p. 163).

Porphyra perforata f. segregata Setchell and Hus.

On rocks. West coast of Whidbey Island, Wash., *N.L.G.*, No. 66!; Seattle, Wash., *Tilden*, No. 228!, under *P. leucosticta*.

This is a dwarf form, with thickened cell walls and the upper and lower halves of the contents of the antheridia separated by a thick gelatinous wall.

Porphyra Nereocystis C. L. Anderson.

On *Nereocystis Luetkeana*. Harvester Island, Uyak Bay, Kadiak Island, Alaska, *W.A.S. and A.A.L.*, No. 5112!; St. Paul, Kadiak Island, Alaska, *W.A.S. and A.A.L.*, No. 5149!; Whidbey Island, Wash., *N.L.G.*!

This species may be known from forms of the preceding species by its red color, usually thinner frond, and by the arrangement of the sporocarps and antheridia which do not form the narrow elongated more or less linear patches of *P. perforata*.

Porphyra naiadum f. minor Hus.

On leaves of Phyllospadix. Port Renfrew, B. C., *Tilden*, No. 516!, *Butler and Polley*, No. 47.

Porphyra naiadum f. major Hus.

On the leaves of Zostera. West coast of Whidbey Island, Wash., *N.L.G.*, Nos. 182!, 183!, 273!; Brown Island, San Juan County, Wash., *Tilden*, No. 231b!; Seattle, Wash., *Tilden*, No. 231a! (a very poor specimen.)

P. naiadum is a very distinct species on account of the cushion-shaped parenchymatous prothallus, as has been shown by Hus (1902).

Porphyra amplissima (Kjellman) Setchell and Hus.

On rocks, upper sublitoral zone. Amaknak Island, Bay of Unalaska, Alaska, *W.A.S. and A.A.L.*, No. 3268!; Unga,

Alaska, *A.A.L.*, No. 5047!; Orca, Alaska, *W.A.S. and A.A.L.*, No. 5165!, *Saunders*, No. 259a! and 1901, p. 433, cited as from "Prince William Sound"; west coast of Whidbey Island, Wash., *N.L.G.*, Nos. 47!, 199b!, 280!, 688!, and in Collins, Holden and Setchell, P. B.-A., No. XLIX!

P. amplissima is very variable as to size, habit and tint of red, but it is always distromatic and has the antherozoids in four tiers of four each in the antheridium, as Kjellman has figured them (1883, pl. 18, f. 8).

Porphyra miniata f. cuneiformis Setchell and Hus.

On rocks, on wood, and on other algæ. Lowe Inlet, Alaska, *Saunders*, No. 20!; Victoria, B. C., *Tilden*, No. 230!; west coast of Whidbey Island, Wash., *N.L.G.*, No. 199a!, in Collins, Holden and Setchell, P. B.-A., No. 929!; Pleasant Beach, Kitsap County, Wash., *N.L.G.*, No. 348!

This species is to be distinguished from the two following very nearly related species, by its habit or color, being decidedly darker red and rather thicker than the next, and larger and more completely distromatic than *P. abyssicola*.

Porphyra tenuissima (Stroemfelt) Setchell and Hus.

On rocks and other algæ. Shumagin Islands, Alaska, *Saunders*, No. 384!; Yakutat Bay, Alaska, *Saunders*, No. 214!, *Rev. Albin Johnson*, No. 5705!

Readily recognized, as a rule, by its thin, light red or pink, distromatic frond.

Porphyra abyssicola Kjellman.

On Zostera. West coast of Whidbey Island, Wash. *N.L.G.*, 273a!

As stated above, this species is not very distinct from *P. miniata* f. *cuneiformis*, differing from that plant in its smaller size and less distinctly or less completely distromatic frond.

Porphyra variegata Kjellman.

Found floating up from the sublitoral zone where it grows on rocks. West coast of Whidbey Island, Wash., *N.L.G.*, Nos. 177!, 179!, 279!, 687!, and in Collins, Holden and Setchell, P. B.-A., No. 930!

The type is *Diploderma variegatum* Kjellman (1889, p. 33, pl. 2, f. 1–4) from Bering Island, Siberia. The species is readily recognized by its thick and variegated frond. To this species must be joined *P. occidentalis* Setchell and Hus (Hus, 1900, p. 69 and 1902, p. 228, pl. 21, f. 15a–17b), since farther search on the coast of California has brought other more luxuriant, thicker specimens to light and it has been made certain that it is the antheridial plant of *P. variegata*.

Erythrotrichia ceramicola (Lyngbye) Areschoug.

On *Lophosiphonia villum*. St. Paul, Kadiak Island, Alaska, *W.A.S. and A.A.L.*, No. 5148a!

Family HELMINTHOCLADIACEÆ.

Batrachospermum monilforme Roth.

Chilukweynk Valley, Vancouver, Island, B. C., *Harvey* (1862, p. 176).

We know this only from the reference and consequently do not know whether it is *B. moniliforme* in the sense of Sirodot or not. The species of this genus have not been sufficiently studied as yet, but we shall attempt to refer ours to the species of Sirodot's monograph, at least provisionally.

Batrachospermum moniliforme f. typicum Sirodot.

In fresh water streams. Baird Creek, Port Renfrew, B. C., *Tilden*, No. 332!, under *B. moniliforme* var. *Scopula*; Port Renfrew, B. C., *Butler and Polley* and in Collins, Holden and Setchell, P. B.-A., No. 876!

The two collections quoted above seem to be typical of this species as we understand it. The cystocarps are of uniform size, not large, and situated in the outer half of the verticil but well included.

Batrachospermum moniliforme f. helminthoideum Sirodot.

In a creek. Orcas Island, Wash., *N.L.G.*, No. 702.!

We have some doubt of the determination of this plant, but it seems to agree with the description of Sirodot. It differs from

the last in having the interverticillary filaments developed to such an extent as to obscure the moniliform habit.

Batrachospermum pyramidale Sirodot.

Attached to boards and stones in a rapidly running stream of fresh water. Newhall, Orcas Island, Wash., *N.L.G.*, No. 616!

The verticils are usually globular, distant, and distinct, while the cystocarps vary in size and distance from the center of the verticil, all, however, being included within it.

Batrachospermum densum Sirodot.

On stones in a small rill of fresh water. Amaknak Island, Bay of Unalaska, Alaska, *W.A.S. and A.A.L.*, No. 3298!

The verticils are discoid and confluent below on account of the growth of the interverticillary filaments. The whole plant is dark purplish green. . The cystocarps are small with relatively large spores included within the inner half of the verticil.

Batrachospermum ectocarpum Sirodot.

Attached to stones in running fresh water. Near Dexter, Golofnin Bay, Alaska, *R. C. McGregor*, No. 5664!; Chambers Creek, near Tacoma, Wash., *N.L.G.*, No. 427!

Distinguished by the large cystocarps which are at the outer edge of the verticil, often more or less exserted, but without conspicuous bracteoid filaments.

Batrachospermum vagum f. flagelliforme Sirodot.

In ponds, pools, and streams of fresh water.

Kadiak Island, Cook Inlet, and Virgin Bay in Prince William Sound, Alaska, *Saunders* (1901, p. 433).

Batrachospermum vagum f. keratophytum Sirodot.

In a stream of fresh water. Near Port Renfrew, B. C., *Tilden*, No. 515!, *Butler and Polley*, in Collins, Holden and Setchell, P. B.-A., No. 879a!

Batrachospermum cœrulescens Sirodot.

Nooksack River, Whatcom County. Wash., *N.L.G.*, No. 701!

The material is preserved in formalin, so that the color is no longer apparent, but the plant, when fresh, was decidedly blue, and

is certainly of the *Viridia*-group, dicœcious and at least very near to this species as understood by one of us in Collins, Holden and Setchell, P. B.-A., Fasc. IV, No. 190, 1896.

Chantransia secundata Lyngbye.

On hydroids. San Juan Island, Wash., *Tilden*, No. 308!, under *Callithamnion secundatum*.

The specimen in our copy is sterile and looks more like *Ch. Daviesii* (Dillwyn) Thuret.

Family CHÆTANGIACEÆ.

Whidbeyella Setchell and Gardner gen. nov. Chætangiacearum. Plates 23, 24.

Frond flat, membranaceous, composed of coarse filaments running longitudinally in the medulla and curving outward to the periphery, which branch di- to trichotomously and whose terminal cells form the single peripheral layer of the frond; rhizoidal filaments abundant, forming the greater portion of the thickness of the frond, slender, with somewhat of a longitudinal course; cystocarps scattered through the substance of the frond, not projecting above the surface, opening by small carpostomes on either surface, with the procarpic branch remaining and forming a distinct pedicel of several cells; fruit cavity piriform, enclosed by a wall of several layers of delicate, parallel, concentric bracteoid filaments and lined with the slender gonimoblastic filaments which send out branches into the fruit cavity, which bear the spores singly at the joints; spores ellipsoidal.

The description of this proposed genus, must necessarily remain somewhat imperfect, since we have only a single battered specimen with immature cystocarps. The structure, however, of both frond and cystocarp is so distinct that we feel fully justified in publishing it. It is intermediate between Galaxaura, which it resembles fairly closely in its cystocarp, and Chætangium which it resembles in its frond. Its structure is different from the latter in having an external tissue of a single layer of cells

and in having the gonimoblasts uniformly lining the interior of the fruit cavity, while from the former, it differs in being membranaceous and uncalcified. The name is taken from Whidbey Island, Wash., a locality furnishing us many rare plants.

Whidbeyella cartilaginea Setchell and Gardner gen. et. sp. nov. Plates 23. 24.

Plant 15 cm. high, several fronds arising from the same point; holdfast unknown; fronds narrowly cuneate below, gradually widening above and deeply lobed or parted into a few, palmate, blunt divisions which are somewhat proliferous from the margins.

Cast ashore. West coast of Whidbey Island, Wash., *N.L.G.*, No. 632!

Only a single battered specimen preserved in formalin solution is available. The color was a light red. The cystocarps are just beginning to form spores. The consistency is very firmly cartilaginous. The figures represent the habit and the structure of the plant much better than it can be described.

Family GELIDIACEÆ.

Choreocolax Polysiphoniæ Reinsch.

On stems of Polysiphonia. Sitka, Alaska, *Saunders*, (1901, p. 433).

Gelidium corneum var. lepadicola P. & R.

Gelidium corneum var. simplex P. & R.

These two plants are mentioned by Postels and Ruprecht (1840, p. 16) as occurring on shells at Sitka, Alaska. We fail to find any farther information concerning them.

Gelidium Amansii Lamouroux.

On rocks, lower litoral and upper sublitoral zones. Port Renfrew, B. C., *Tilden*, No. 513!, under *G. latifolium*; East Sound, Orcas Island, Wash., *N.L.G.*, No. 522!

We are indebted to Mr. Collins for comparing Miss Tilden's plant with material from the Californian Coast referred to this species by Dr. Bornet. Similar plants have been distributed

from San Diego, California, under No. 585, Collins, Holden and Setchell, P. B.-A. (1899).

Endocladia muricata (Harvey) J. Agardh.

On stones and rocks in the upper portion of the litoral zone. Unalaska, Alaska, *Postels and Ruprecht* (1840, p. 16); Popof Island, Alaska, *Saunders* (1901, p. 434); Harvester Island, Uyak Bay, Kadiak Island, Alaska, *W.A.S. and A.A.L.*, No. 5123!; Prince William Sound, Alaska, *Saunders* (1901, p. 434); Orca, Alaska, *W.A.S. and A.A.L.*, No. 5158!; Sitka, Alaska, *Postels and Ruprecht* (1840, p. 16, under *Gigartina muricata*); Wrangell, Alaska, *Saunders* (1901, p. 434); Vancouver Island, B. C., *J. G. Agardh* (1876, p. 558, under *E. muricata* and p. 559, under *E. hamulosa*); Esquimalt, B. C., *Harvey* (1862, p. 173); Port Renfrew, B. C., *Butler and Polley*, Nos. 25, 32, and 38.

In the present species we have a plant to which the same name was given at about the same time by two different authorities. Harvey gave the name *Gigartina muricata* to a form from San Francisco in 1839 or early in 1840 as far as dates may be settled with any certainty, while Postels and Ruprecht gave the same name to a form of the same species in 1840. It has seemed best to us to take the plant of Harvey as the f. *typica* and to consider San Francisco as the type locality. This plant is well described by Harvey in the Nereis Boreali-Americana (1852, p. 182, pl. 27, B). It is more or less irregularly branched, cylindrical, and beset with spines which are simple or slightly bifid. The specimens quoted above, so far as we have seen them or so far as they are described, seem to belong to the typical form as described by Harvey and as we have found it in the neighborhood of San Francisco. The *E. hamulosa* (Ruprecht) J. Agardh seems to differ from *E. muricata* only in having the cystocarps at the bases of the ramuli, while in the latter species they are simply lateral. We have found both sorts on the same plant, so it has seemed best to include both under the older name. Harvey states that Ruprecht's *Acanthocladia muricata* is more slender and less regularly muricated than his *E. muricata* and that Ruprecht's *A. hamulosa* is identical with his *E. muricata* (loc. cit., p. 183).

Endocladia muricata f. **compressa** Setchell and Gardner f. nov.

Cylindrical below, but decidedly flattened above. Otherwise as in the typical form.

In rock pools near high water mark. Friday Harbor, San Juan Island, Wash., *N.L.G.*, No. 216!

This may possibly be the *E. complanata* Harvey from Japan, but as we have not seen a specimen of that species and, as it is described as decompositely dichotomous which ours certainly is not, we feel that this may be left with only a form name. *F. compressa* seems to be a plant of quiet waters while the type grows on exposed coasts.

Endocladia muricata f. **inermis** Setchell and Gardner f. nov.

A dwarf plant almost or quite destitute of spines.

In small tide pools at high-water mark, much exposed to sun and rain. Friday Harbor, San Juan Island, Wash., *N.L.G.*!

A very distinct form growing in short densely interlaced rigid tufts, and striking on account of its smooth or very nearly smooth frond.

Chondrus crispus (L.) Lyngbye.

On rocks in the litoral zone. St. Lawrence Island, Alaska, *Kjellman* (1889, p. 32, under *C. platynus*); St. Michael, Alaska, Herb. *D. C. Eaton*, No. 14!, under *C. platynus*, *W.A.S.*, Nos. 5154x!, 5246y!; St. Paul Island, Alaska, *Greeley and Snodgrass*, No. 5807! (Setchell, 1899, p. 593, under *C. platynus?*); near Iliuliuk, Unalaska, Alaska, *W.A.S. and A.A.L.*, Nos. 3290!, 4034!, 4034a!; North Pacific Ocean, *Postels and Ruprecht* (1840, p. 17).

After a careful study of the forms of Chondrus of both sides of the North American continent from the living specimens and a careful comparison of such European specimens as are available, together with such descriptions, critical notes and figures as have been published, it seems to us that the species described from our territory are better understood if placed under *C. crispus* and its various forms. It seems to us that No. 4034a, which shows young cystocarps and agrees in habit with Kjellman's

Gigartina Pacifica is really a Chondrus (since it has the cystocarpic structure of a Chondrus) and belongs under this species. We cannot feel certain of *C. platynus* (Agardh) J. Agardh, but can find no difference between it and the European species. We shall make no attempt to separate the numbers known to us into forms, but if we should do so, they would fall under several form-names.

Chondrus affinis Harvey.

Esquimalt, B. C., *Harvey* (1862, p. 173).

We have not seen this plant from our territory, but feel that it is probably only another form of the preceding species.

Iridæa laminarioides Bory.

On rocks in the upper sublitoral zone. Puget Sound, *Saunders* (1901, p. 434); Port Renfrew, B. C., *Butler and Polley*, Nos. 44, 76, and 77.

We have not seen these specimens and consequently place them under the species without comment. Postels and Ruprecht describe (1840, pp. 17 and 18) a number of species from the North Pacific Ocean and consequently belonging, in all probability, to our territory, which are possibly forms of this species. They are placed tentatively under the various form-names in the following account according to the descriptions as given by the authors mentioned. *I. lacera* and *I. socialis* cannot even be guessed at, and *I. Cornucopiæ* is referred doubtfully to *Sarcophyllis arctica*. We have not attempted to refer several of the species noted only from Kamtschatka.

Iridæa laminarioides f. typica Setchell.

This is a form common on the Californian coast, with elongated lanceolate and, for the most part, entire frond, answering well to the description and figure of Bory (1828, p. 105, pl. 11, f. 1, especially D). It has been distributed under this name from San Francisco, California, by one of us in Collins, Holden and Setchell, P. B.-A., No. XVI (1899).

On rocks in the lower litoral zone. West coast of Whidbey Island, Wash., *N.L.G.*, No. 58!

Iridaea laminarioides f. **cordata** (Turner) Setchell and Gardner comb. nov.

On rocks, upper and middle litoral zones. Shumagin Islands, Yakutat Bay, and Sitka, Alaska, *Saunders* (1901, p. 434, under *I. membranacea*?; Banks Island, B. C., *Menzies* (cf. Turner, 1809, p. 118, pl. 116, under *Fucus cordatus*); Victoria, B. C., *Tilden*, Nos. 328b! (cystocarpic, under *I. laminarioides*), 328c!, (tetrasporic, under *I. laminarioides*); Esquimalt, B. C., *Harvey* (1862, under *I. cordata*); west coast of Whidbey Island, Wash., *N.L.G.*, Nos. 43b!, 102!, 180!; Channel Rocks, near Port Orchard, Kitsap County, Wash., *Tilden*, No. 329!, under *I. heterocarpa*.

We have arranged the plants mentioned above under this form only after an extended study of the Iridæas of the western coast of North America in the places where they are to be found growing in abundance. The f. *cordata* is to be distinguished by its short, broad, cordate, thick, and cartilaginous frond which may be entire or may be much lobed, either in a regular or an irregular way, and by the large (2–3 mm. broad) prominent and irregularly lobed cystocarps. It seems to us that the following species of the North Pacific Ocean may probably be placed here also, viz.: *I. heterocarpa* P. & R. (1840, p. 18) and *I. lilacina* P. & R. (loc. cit., p. 17). Saunders's plants are referred here because of his statement that they are the same as No. 329, Tilden. They do not seem to be the same as *I. membranacea* J. Agardh, at least as figured by him (1879, pl. 10, f. 1–5). That is apparently a thinner and softer plant and of decidedly different habit.

Iridæa laminarioides f. parvula Kjellman.

On rocks, on exposed shores, upper and middle litoral zones. St. Paul Island, Alaska, *Greeley and Snodgrass*, No. 5799! (Setchell, 1899, p. 593); west shore of Amaknak Island, Bay of Unalaska, Alaska, *W.A.S. and A.A.L.*, Nos. 3253!, 4042!; "Pinnacles," Bay of Unalaska, Alaska, *W.A.S. and A.A.L.*, No. 5006!, and in Collins, Holden and Setchell, P. B.-A., No. 931!; Karluk, Kadiak Island, Alaska, *W.A.S.*, No. 5066!; Harvester Island, Uyak Bay, Kadiak Island, Alaska, *W.A.S. and A.A.L.*, No. 5120!

A dwarf form closely approaching the preceding in its larger conditions.

Iridaea laminarioides f. **punicea** (P. & R.) Setchell and Gardner comb. nov.

On rocks, upper sublitoral zone. Unga, Alaska, *A.A.L.*, No. 5050!; Sitka, Alaska, *Postels and Ruprecht* (1840, p. 18); west coast of Whidbey Island, Wash., *N.L.G.*, Nos. 60!, 142!, 143!, 150!, 154!, 292!, 293!; San Juan Island, Wash., *Tilden*, No. 328a, under *I. laminarioides*.

A large form often a meter or two in length and of an exceedingly bright red purple color. It has been found with both cystocarps and tetraspores. It is not uncommon in Puget Sound and extends southward to Port Harford, San Luis Obispo County, California.

Iridæa oblongifructa Setchell

Cast ashore and growing on the stipes of Pleurophycus and Pterygophora in the sublitoral zone. West coast of Whidbey Island, Wash., *N.L.G.*, Nos. 56!, 283!

A large species, resembling *Sarcophyllis Californica* in appearance, but with oblong cystocarps. This may be a species of Callymenia, but the habit does not agree with that genus. It is found but seldom and only a few specimens are accessible to us.

Rhodoglossum latissimum J. Agardh.

In the sublitoral zone. West shore of Whidbey Island, Wash., *N.L.G.*, Nos. 101!, 140!

Only a few specimens have been found and these are cystocarpic. Consequently, the genus must remain in doubt, since the difference between Iridæa and Rhodoglossum depends upon the character of the tetrasporic sorus. The fronds are thin, the cystocarps regular and circular, and evenly distributed over the frond. It resembles in these respects the plants from the Californian coast referred to this genus. It has seemed best to us to retain J. G. Agardh's genus Rhodoglossum, since in habit, to some extent, and especially in the structure of the sorus, it is amply distinct from Iridæa.

Gigartina Pacifica Kjellman.

On rocks in the upper part of the sublitoral zone. Shumagin Islands, Alaska, *Saunders* (1901, p. 435).

The type plant is from Bering Island where Kjellman says it is fairly common. He says that it has proliferations from the disk as well as from the margins, but his figures show those from the disk only sparingly. As has been stated above, we have plants from Unalaska which agree well with Kjellman's description and figure, but the cystocarp is decidedly that of Chondrus and we have referred them to forms of *C. crispus*. We have not seen the specimens of Saunders. Near this plant, whatever its disposition, are probably to be placed Ruprecht's *Chondrus mamillosus* var. *Ochotensis* and *C. mamillosus* var. *Unalaschensis* (1851, pp. 318 and 319). The description of the latter seems to point directly to Kjellman's plant, while the former is a more slender plant. In both, the papillæ are confined to the margins and ends, and point towards forms of *C. crispus*, to which we feel inclined to refer all three plants under discussion.

Gigartina mamillosa (Goodenough and Woodward) J. Agardh.

We have long been of the opinion that the forms of Gigartina of the western coasts of North America commonly referred to *G. papillata* (Agardh) J. Agardh, are merely forms of the species of Europe and it has seemed safe to refer them under it in this paper. The type as outlined by Goodenough and Woodward (1795, p. 174) seems to be a form similar if not identical with our f. *cristata*. This species is given as from Unalaska and Sitka by Postels and Ruprecht (1840, p. 17).

Gigartina mamillosa f. **cristata** Setchell comb. nov.

On rocks in the litoral zone about half way between tide marks. Kukak Bay, Alaska, *Saunders* (1901, p. 435, under *G. papillata* f. *cristata*); Orca, Alaska, *W.A.S. and A.A.L.*, No. 5157!; Esquimalt, B. C., *Harvey* (1862, p. 172, under *G. mamillaris* f. *latissima*); west coast of Whidbey Island, Wash., *N.L.G.*, Nos. 67!, 77!, 195!; Tracyton, Kitsap County, Wash., *Tilden*, No. 219!, under *G. radula* and No. 326!, under *G. papillata* f. *cristata*.

Gigartina mamillosa f. **cristata** subf. **prolifera** Setchell and Gardner subf. nov.

On rocks in the litoral zone. Orca, Alaska, *W.A.S. and A.A.L.*, No. 5167!; Yakutat Bay, Alaska, *Rev. Albin Johnson*, No. 5707!; Tracyton, Kitsap County, Wash., *Tilden*, No. 220!, under *G. mamillosa*.

This differs from the preceding by the papillæ being produced into lanceolate blades. It is merely a sterile foliiferous state of the preceding, but is of common occurrence on the coast of California in waters containing a considerable admixture of fresh water.

Gigartina mamillosa f. **dissecta** Setchell comb. nov.

Esquimalt, B. C., *Harvey* (1862, p. 172, under *G. mamillaris* f. *vulgaris*).

This seems to be the same as *G. papillata* f. *dissecta* Setchell.

Gigartina mamillosa f. **subsimplex** Setchell comb. nov.

On rocks in the upper litoral zone. Captains Bay, Unalaska, Alaska, *W.A.S. and A.A.L.*, No. 5013!; Shumagin Islands, Alaska, *Saunders* (1901, p. 434, under *G. papillata* f. *typica*); Harvester Island, Uyak Bay, Kadiak Island, Alaska, *W.A.S. and A.A.L.*, No. 5114!; Sitka, Alaska, *Ruprecht* (1851, p. 318, under *Chondrus mamillosus* var. *Sitchensis*).

This is the type of C. A. Agardh's *G. papillata*, the type specimen of which was collected by Chamisso. Chamisso labelled the plant as coming from Oahu, one of the Hawaiian Islands, but as Ruprecht (1851, p. 318) remarks, it probably came from Unalaska. It is *G. papillata* f. *subsimplex* Setchell.

Gigartina radula f. typica Setchell.

On rocks lower litoral and upper sublitoral zones. Puget Sound, *Bailey and Harvey* (1862, p. 162); Strait of Juan de Fuca and Victoria, B. C., *Harvey* (1862, p. 172); Port Renfrew, B. C., *Butler and Polley*, No. 73; west coast of Whidbey Island, Wash., *N.L.G.*, No. 175!

With the exception of Gardner's specimen, we assume that the references quoted belong to the typical form of this species. Gardner's specimen is near the type, but not exactly corresponding.

Gigartina radula f. microphylla (Harvey) Setchell.

Floating. West shore of Whidbey Island, Wash., *N.L.G.*, No. 64!

This plant seems to correspond to Harvey's *G. microphylla*, which one of us (cf. Setchell, in Collins, Holden and Setchell, P. B.-A., No. XIX, 1899), has already reduced to a form of *G. radula*.

Gigartina radula f. exasperata (Harvey and Bailey) Setchell.

On rocks, lower litoral and upper sublitoral zones. West coast of Whidbey Island, Wash., *N.L.G.*, Nos. 103!, 104!, 105!, 170!, 172!, 173!, 174!, 282!; Channel Rocks, near Port Orchard, Kitsap County, Wash., *Tilden*, No. 327!, under *G. spinosa*; Tracyton, Kitsap County, Wash., *Tilden*, No. 218!; opposite Fort Nisqually, Pierce County, Wash., *Harvey and Bailey* (1851, p. 371, under *G. exasperata*), *Bailey and Harvey* (1862, p. 162, under *G. exasperata*).

The *Gigartina exasperata* Harvey and Bailey (1851, p. 162, pl. 5) was founded on the young tetrasporic plant which is more thin and more ample than the adult. The adult cystocarpic plant of this species is decidedly thick and takes on the form described by Kuetzing as *Mastocarpus corymbiferus* (1867, pl. 46) and is well represented by the specimen (in our copy) under No. 327 of Tilden's American Algæ. The morphology and histology have been described by Olsen (1899) and by Humphrey (1901). Turner's figure (1808, pl. 25) of *Fucus bracteatus*, credited to the coast of Northwestern America, represents a plant intermediate between the type and this form. The young plant of this form is often a very large plant, a meter or two long and broad in proportion. As it matures it seems to become smaller and thicker. These observations were made principally on the coast of California, where this form is found in abundance.

Erythrophyllum delesserioides J. Agardh.

On rocks in the upper sublitoral zone. Vancouver Island, B. C., *Wood* in Herb. J. E. Gray (fide J. G. Agardh, 1870, p. 11); Port Renfrew, B. C., *Tilden*, No. 505!, *Butler and Polley*, No. 2.

Apparently the northern limit of this species which is abundant on the Californian coast. Miss Tilden's plant represents a young form. As growing on the Californian coast, this species at first forms a frond with smooth, veined surfaces. As the plant matures, papillæ appear on the surfaces until they are thickly covered. The tetraspores and cystocarps are formed in these papillæ in a fashion similar to the method of formation in Gigartina. Finally the surfaces wear away, leaving the veins as coarse cords covered still with papillæ. This final stage might not be recognized as belonging to the same plant as the earlier ones. The two stages have been distributed in the P. B.-A, under Nos. 50 and 588, while very young and depauperate plants have been distributed in the Phykotheka Universalis, No. 606.

J. G. Agardh, in his later work (1899, pp. 57–60), doubts the accuracy of the determination of the plants referred to this species by other algologists and finally proposes the name *Polyneura Californica* for the one distributed more recently. The two plants seem to differ, in sterile condition, by the more denticulate margin, the more simple frond, and the more completely percurrent midrib of the original plant. Our specimens, of the same age, agree perfectly with the figure given by Agardh (1879, pl. 15, f. 1) and it is possible to find in the same bunch of plants, specimens agreeing equally well with all that he has said of his *Polyneura Californica*. In view of the Gigartinaceous cystocarp, it is necessary to place this genus here rather than with the Dumontiaceæ where Schmitz placed it, and on account of the tetraspores and cystocarps being borne in papillæ or proliferations, it seems to take a position next to Gigartina.

Phyllophora Brodiæi (Turner) J. Agardh.

Arctic coast of Alaska, *Harvey* (1872, p. 463).

In Rothrock's list, Harvey reports a single specimen of a broad leaved variety of this species.

Phyllophora interrupta (Greville) J. Agardh.

Point Barrow, Alaska, *Farlow* (1885, p. 192, 1886, p. 474).

Farlow reports that fine typical specimens of this species were collected by Mr. John Murdock at this locality.

Ahnfeldtia plicata (Hudson) Fries.

On rocks in the lower litoral and upper sublitoral zones. Arctic coast of Alaska, *Harvey* (1872, p. 463); St. Lawrence Island and Port Clarence, Alaska, *Kjellman* (1889, p. 30); St. Michael, Alaska, Herb. *D. C. Eaton*, No. 16!; St. Paul Island, Alaska, *Ruprecht* (1851, p. 326, under *Gymnogongrus fastigiatus* f. *crassior*?); Unalaska, Alaska, *Ruprecht* (1851, pp. 251 and 327, under *Gymnogongrus fastigiatus*); Kadiak Island, Alaska, *Ruprecht* (1851, p. 326, under *Gymnogongrus fastigiatus* f. *crassior*); Prince William Sound and Yakutat Bay, Alaska, *Saunders* (1901, p. 435); Sitka, Alaska, *Postels and Ruprecht* (1840, p. 16, under *Gigartina fastigiata*); North Pacific Ocean, *Postels and Ruprecht* (1840, p. 16, under *Gigartina plicata*); Esquimalt and Fuca Strait, *Harvey* (1862, p. 171); Port Renfrew, B.C., *Butler and Polley*, No. 8 (in part); Whidbey Island, *N.L.G.*, No. 30!

While it seems certain that this species is distributed along the whole coast of North America, so far as our own experience is concerned, it seems to be scarce.

We do not know what to do with Ruprecht's species *Gymnogongrus fastigiatus* and its f. *crassior*, but refer it here with a feeling that perhaps some of it may belong with the next. Schmitz (1893, p. 394) seems inclined to reckon the Ruprecht plant as a variety, at least, of *A. plicata*.

Ahnfeldtia concinna J. Agardh.

Port Renfrew, B. C., *Butler and Polley*, No. 27; west coast of Whidbey Island, Wash., *N.L.G.*, No. 35!

A coarser species and, in No. 35, provided with cystocarps. We have united under this name the *A. concinna* and the *A. Gigartinoides* of J. G. Agardh.

Sterrocolax crassior Schmitz.

On *Ahnfeldtia plicata*, apparently parasitic. St. Michael, Alaska, Herb. *D. C. Eaton*, No. 16!; Unalaska, Alaska, *Ruprecht* (1851, p. 327, as nemathecia of *Gymnogongrus fastigiatus* f. *crassior*), *Schmitz* (1877, p. 394); Kadiak Island, Alaska, *Ruprecht* (1851, p. 327, as in Unalaska specimen); Port Renfrew, B. C., *Butler and Polley*, No. 81 (in part).

It seems that this species must be very near to *S. decipiens* Schmitz or at most only a variety of it.

Callophyllis furcata f. **dissecta** Farlow in Herb.

Cast ashore from rocks in the upper litoral zone. Port Renfrew, B. C., *Tilden*, No. 325!, under *C. obtusifolia*, *Butler and Polley*, No. 109; west coast of Whidbey Island, Wash., *N.L.G.*, No. 63!

The typical form of this species, distributed by Farlow in Farlow, Anderson and Eaton, Algæ Exsiccatæ Americæ Borealis, No. 127, and by Setchell in Phycotheca Boreali-Americana, No. 883, is a broad, much forked plant with the angles very acute and the lobes approximate. The cystocarps are large and confined to the body of the frond. The tips of the lobes are obtuse. The f. *dissecta* which grades into f. *typica* is flabellately much lobed and dissected, but in color, texture, and coarseness resembles very closely the type. It is still to be settled whether *C. furcata* is to be considered as included under the *C. obtusifolia* of J. G. Agardh or not.

Callophyllis laciniata (Hudson) Kuetzing.

Esquimalt, B. C., *Harvey* (1862, p. 162); Puget Sound, *Bailey and Harvey* (1862, p. 162).

Known to us only from the two references quoted above.

Callophyllis flabellulata Harvey.

In the upper sublitoral zone, at a depth of 8–10 feet. Esquimalt, B. C., *Harvey* (1862, p. 171).

A species resembling *Euthora cristata* in habit and having the cystocarps at or very near the tips of the lobes. We have seen Californian material referred to this species, but no specimens from our territory.

Callophyllis rhynchocarpa f. cristata Ruprecht.

On other algæ. Unalaska, Alaska, *Ruprecht* (1851, p. 262).

Callophyllis rhynchocarpa f. incisa Ruprecht.

Sitka (or Unalaska?), Alaska, *Ruprecht* (1851, p. 262).

We have seen nothing resembling the forms of this species.

Callophyllis variegata (Bory) Kuetzing.

St. Paul Island, Alaska, *Ruprecht* (1851, p. 263); Esquimalt, B. C., *Harvey* (1862, p. 172).

This species, more or less common on the coast of California, is unknown to us from our territory other than as stated above. Ruprecht says that the St. Paul plant comes nearer to this species than to any other.

Callymenia reniformis (Turner) J. Agardh.

In 10 fathoms of water. Esquimalt, B. C., *Harvey* (1862, p. 172).

The only reference to this species found. It is uncertain whether this means the type of the species or not. The type form is found in some abundance at times, cast ashore at Monterey, California.

Callymenia reniformis f. cuneata J. Agardh.

On other algæ, in the sublitoral zone (5–10 fathoms), and cast ashore, often in considerable quantity, from deep water. Shores of the Bay of Unalaska, especially in the neighborhood of Iliuliuk, Unalaska, Alaska, *W.A.S. and A.A.L.*, Nos. 3263!, 4054!, 4089!, 4091!, 4092!, 4098!, 5047a!, and in Collins, Holden and Setchell, P. B.-A., No. 498!; Bay of Morozof (Morzhovoi Bay), Alaska, *Townsend*, No. 5777!

A fine and large plant, differing from the species in being cleft palmately into few or many, broader or narrower divisions. Both cystocarpic and tetrasporic specimens were found. In the majority of plants the margins are entire, but in some specimens they are very crispate.

Callymenia ornata (P. & R.) J. Agardh.

Yakutat Bay, Alaska, *Rev. Albin Johnson*, No. 5703!

The type plant is from Kamtschatka. Ours is not so luxuriantly developed, but the comparatively long stipe, the cuneate base, the color, thickness, and lobing, point directly toward this species. Some of ours is in cystocarpic condition.

Callymenia Gmelini Grunow.

Agattu Island, Alaska, *Townsend*, No. 5757!

This plant has a certain resemblance to the last, but is smaller and differs somewhat in the structure of the cross section of the

blade. It certainly resembles the figure of Gmelin (1768, pl. 23) which Grunow (1868, p. 72) says represents the habit of the Kurile plant. Two of our plants have cystocarps which are large, projecting more on one surface than on the other, and are in structure distinctly those of a Callymenia. DeToni (1897, p. 305) is inclined to refer Grunow's species to *Phyllophora nervosa* (DC.) Greville, but our plant is certainly not a form of that species.

Callymenia Phyllophora J. Agardh.

Cast ashore from deep water. Unga, Alaska, *A.A.L.*, Nos. 5052!, 5055!, 5056b!; Harvester Island, Uyak Bay, Kadiak Island, Alaska, *W.A.S. and A.A.L.*, No. 5119!; Kukak Bay, Alaska, *Saunders* (1901, p. 435, under *C. Californica*); Vancouver Island, B. C., *J. G. Agardh* (1870, p. 9, 1892, p. 72, under *Blastophye Phyllophora*); Port Renfrew, B. C., *Tilden*, No. 324!, under *C. Californica*, *Butler and Polley*, No. 79; west coast of Whidbey Island, Wash, *N.L.G.*, No. 43!

After a considerable study of the variations of *C. Californica* Farlow as it occurs on the western coast of North America, it has seemed best to refer it to *C. Phyllophora*. There are two series of variations of this plant, as we understand it, which shade into one another. The one may be characterized by the general orbicular shape of the main frond and its proliferations, with the margins entire or slightly ciliate. This is the type of *C. Californica*. The other series may be characterized by the elongated shape of the main frond and its divisions, with the margins, as a rule, long ciliate. This seems to be the type of *C. Phyllophora*, and is also the *Prionitis? Clevelandii* Farlow (1877, p. 242). Both types are represented in our collections, the type of Agardh from Whidbey Island, which may be distinguished as f. **typica,** while the other specimens we have seen all belong to the type of *C. Californica*, which may be distinguished as f. **orbicularis.** Some of the specimens reach a very considerable size, one leaflet of f. *orbicularis*, e. g., measuring 30 cm. in diameter. The texture of this species is much more firm than that of any other of our species of the genus, even exceeding that of *C. ornata* and forming the greatest contrast to that of *C. reniformis*.

Family RHODOPHYLLIDACEÆ.

Cystoclonium gracilarioides Harvey.

Upper sublitoral zone. Esquimalt, B. C., *Harvey* (1862, p. 171); Port Angeles, Clallam County, Wash., *Lichtenthaler!*

The type specimen is sterile, but the Port Angeles specimen has cystocarps and is certainly a member of this genus, although we feel somewhat uncertain as to whether it is the species of Harvey or not. It does not seem to differ essentially from the New England forms of *C. purpurascens*.

Agardhiella tenera (J. Agardh) Schmitz.

On rocks in the upper sublitoral zone. "North West Coast," *Harvey* (1852, p. 154, pl. 23 B, under *Rhabdonia Coulteri*); Puget Sound, *Harvey and Bailey* (1851, p. 371, under *Hypnæa Coulteri*), *Bailey and Harvey* (1862, p. 162, under *Rhabdonia Coulteri*); Esquimalt, B. C., *Harvey* (1862, p. 170, under *Rhabdonia Coulteri*); west coast of Whidbey Island, Wash., *N.L.G.*, Nos. 130!, 131!; Tracyton, Kitsap County, Wash., *Tilden*, No. 217!, under *Rhabdonia Coulteri*.

There seems to be no difference between the species of the eastern and western coasts, and consequently we feel justified in assigning the *Rhabdonia Coulteri* Harvey (or *Agardhiella Coulteri* (Harvey) Setchell, in Collins, Holden and Setchell, P. B.-A., No. 333, 1897) to the *Agardhiella tenera* (J. Agardh) Schmitz.

Turnerella Mertensiana (P. & R.) Schmitz,

Cast ashore, apparently from deep water. Shumagin Islands, Alaska, *Saunders* (1901, p. 435); Unga, Alaska, *A. A. L.*, No. 5054!; Kukak Bay, Alaska, *Saunders*, No. 352!; Puget Sound, *Bailey and Harvey* (1862, p. 163, under *Iridæa Mertensiana*); Victoria, B. C., *Harvey* (1862, p. 174, under *Iridæa Mertensiana*).

We are very uncertain about the occurrence of this species within the limits of our territory. The type of the *Iridæa Mertensiana* of Postels and Ruprecht came from the Ochotsk Sea. Kjellman (1889, p. 32) found it not uncommon on the shores of Bering Island, but sterile. The plant of Harvey from Victoria was only a fragment. We have been able to examine one of

Saunders's specimens (No. 352) and have referred a fragmentary specimen from Unga here, but we suspect that they may be only specimens of *Iridæa laminarioides* f. *punicea*. They are both sterile but have a parasite, *Chlorochytrium inclusum*, which may be the "glandular cells" mentioned by Schmitz. The habit picture of Postels and Ruprecht (1840, pl. 33) does not correspond to any plant accessible to us. The figure of Kuetzing (1867, pl. 12), at least as far as figure *d* is concerned, might well represent the plant we have known under the name of *Sarcophyllis Californica*, infested with the Chlorochytrium. Our Sarcophyllis, however, belongs clearly to the Dumontiaceæ, certainly not to the Rhodophyllidaceæ. The description of the cystocarp by Schmitz (1896–1897, p. 372) also does not indicate structure sufficiently distinct from that of Sarcophyllis.

Anatheca furcata Setchell and Gardner sp. nov. Plates 23, 24.

Frond arising from a discoid holdfast, cylindrical below (for 1–2 cm.), flattened above, and expanding upward to a length of 20 cm. and a breadth of 2–3 cm., once to thrice forked; substance thick and firm; color dark red; frond possessing a medullary tissue of fine longitudinal hyphal cells, inner cortex of large cells which suddenly become smaller in the outer cortex, while the epidermis is of small, regular, slightly palisade-like cells. Cystocarps scattered over the surfaces of the frond, prominent, hemispherical, with apical carpostome. The placenta is central and composed of large cells; the spores are in groups radiating from the placenta on all sides, and are separated from one another by strands of medullary tissue. Tetrasporangia scattered in the outer cortex, zonately divided.

Cast ashore from deep water. West coast of Whidbey Island, Wash., *N.L.G.*, No. 633!, and in Collins, Holden and Setchell, P. B.-A., No. 932, 1902!

This species might be taken for *Callophyllis furcata* f. *typica* at first glance, so great is the resemblance in habit, color, size, etc. It seems probably a member of the genus Anatheca, and very closely related to the type, *A. Montagnei* Schmitz, from the coast of Senegambia. We have been unable to examine the type

specimen, but the chief difference seems to be the more distinctly serrated margins of the Senegambian plant. Schmitz says (1896–1897, p. 374) that the spores are terminal on the sporiferous filaments. They are so situated in young specimens of our plant, but, in mature cystocarps, they are seriate.

Euthora cristata (L.) J. Agardh.

Abundant in the sublitoral zone. Shumagin Islands and Seldovia, Cook Inlet, Alaska, *Saunders* (1901, p. 435).

We have been unable to examine specimens of the plants mentioned above, but suspect that some of them, at least, may belong rather to what we take to be *E. fruticulosa*.

Euthora cristata f. typica Kjellman.

On other algæ in the upper sublitoral zone. St. Lawrence Island, Alaska, *Kjellman* (1889, p. 27).

Kjellman finds this variety abundant at St. Lawrence Bay in Siberia, and scarce at Bering Island, Siberia and St. Lawrence Island, Alaska. He also finds a plant scarce at Bering Island which he calls f. *pinnata*, but which seems to be close to the next species.

Euthora fruticulosa (Ruprecht) J. Agardh.

Bering Sea, Herb. *University of California*; west coast of Whidbey Island, Wash., *N.L.G.*, No. 32!

These specimens are distinctly different in habit from any specimens of *E. cristata* from New England seen by us. The frond is more elongated and very distinctly pinnate. The plants are all slender and the structure is very much like that of Cystoclonium. The medulla is more distinctly filamentous, while the cortex is composed of several series of cells arranged in short filaments at right angles to the surface. The tetraspores are usually zonate, but some occur which are cruciate, while others are tripartite, and still others are combinations of zonate with either cruciate or tripartite. This occurs also in *E. cristata*.

Rhodophyllis dichotoma f. typica Kjellman,

On other algæ, in the sublitoral region. St. Lawrence Island, Alaska, *Kjellman* (1889, p, 27); St. Paul Island, Alaska, *Ruprecht* (1851, p. 593, under *Ciliaria fusca*).

We have not seen specimens of this plant.

Rhodophyllis dichotoma f. setacea Kjellman.

Unalaska, Alaska, *Ruprecht* (1851, p. 593, under *Ciliaria fusca*).

From Ruprecht's description, it seems fairly certain that his plant from Unalaska belongs under this form of Kjellman.

Family SPHÆROCOCCACEAE.

Gracilaria confervoides (L.) Greville.

On rocks in the upper litoral zone. Esquimalt, B. C., *Harvey* (1862, p. 170); west coast of Whidbey Island, Wash., *N.L.G.*, No. 123!; Tracyton, Kitsap County, Wash , *Tilden*, Nos. 215!, 216!, the latter under *G. confervoides* f. *longissima*.

A common species of the coast of California, but apparently not so common on the shores of Puget Sound. We cannot see any difference between the two forms distributed by Miss Tilden. Certainly what she indicates under f. *longissima* is the ordinary form of the species and seems of equally common occurrence in Europe.

Corallopsis Salicornia (Agardh) Greville.

Unalaska, Alaska, *C. A. Agardh* (1820, pl. 8, under *Sphærococcus Salicornia*).

It is generally admitted that Chamisso must have labelled the type specimen of this species wrong. Ruprecht (1851, p. 318) makes the statement that Chamisso, himself, was doubtful as to whether he obtained the specimen at Unalaska or elsewhere.

Hypnea musciformis (Wulfen) Lamouroux.

C. A. Agardh (1821a, p. 326) gives this species a range in the Pacific Ocean from Unalaska to New Zealand. Turner (1809, p. 146) gives Nootka Sound, B. C., as the locality where Menzies collected the plant he describes under the name of *Fucus musciformis* var. *Nootkanus*. These are the sources of all other references to this plant as an inhabitant of our territory. We believe that the reference to Unalaska may have been made by Agardh under a mistaken geographical impression. Certainly Esper

(1802, p. 30) in giving the distribution of his *Fucus Nootkanus* refers to Nootka Sound as though it were in the southern hemisphere. It seems doubtful to us as to whether Turner's plant may really be *Hypnea musciformis* and there seems a possibility that it may be *Bonnemaisonia hamifera*.

FAMILY RHODYMENIACEÆ.

Fauchea laciniata J. Agardh. PLATE 25.

Rarely cast ashore. West coast of Whidbey Island, Wash., *N.L.G.*, No. 240!

This species, which occurs also on the coast of California, is represented from our territory by both tetrasporic and cystocarpic specimens. The plants have the type of frond characteristic of this species, but it is by the tetrasporic specimens that it is the more certainly told from the following.

Fauchea Gardneri Setchell. PLATE 19.

Cast ashore from deep water. West coast of Whidbey Island, Wash., *N.L.G.*, No. 45!, and in Collins, Holden and Setchell, P. B.-A., No. 933!

Readily told from the preceding, especially by the tetrasporic plant, as may be seen by comparing figure 30 on plate 19 with figure 43 on plate 25.

Rhodymenia pertusa (P. & R.) J. Agardh.

On rocks and stones, upper sublitoral zone. Point Barrow, Alaska, *Farlow* (1885, p. 192, with some doubt); Amaknak Island, Bay of Unalaska, Alaska, *Ruprecht* (1851, p. 394, under *Porphyra pertusa*); Prince William Sound and Yakutat Bay, Alaska, *Saunders* (1901, p. 436); Strait of Juan de Fuca, *Harvey and Bailey* (1851, p. 371, under *R. Wilkesii*), *Bailey and Harvey* (1862, p. 61, under the same name); Point Roberts, B. C., *Harvey* (1862, p. 171); Port Renfrew, B. C., *Butler and Polley*, No. 17; Whidbey Island, Wash., *N.L.G.*, No. 50!, and in Collins, Holden and Setchell, No. L!; in deep water near Seattle, Wash., *N.L.G.*, No. 162!; Port Orchard, Kitsap County, Wash., *Tilden*, No. A!

This is one of the most striking species of Rhodophyceæ found on our American shores. When of full size, it is 40–60 cm. long, and 15–20 cm. wide, more or less regularly perforated. The tetrasporic plant is smooth and usually more ample than the cystocarpic plant, which is covered with the dark, prominent, medium-sized cystocarps. Some plants have peculiar proliferations from the margins and surfaces, which look like the stipes of the adult plants. They have rounded tips when younger, but later produce miniature blades. It is probable that they may, under proper circumstances, grow into new plants. The perforations appear on any portion of the frond, new ones being formed among the older ones. Their formation seems to be accompanied by the destruction of tissue, probably much as in Agarum as described by Humphrey (1886). The morphology and anatomy of this species have been treated somewhat superficially by Butters (1899). He had only the cystocarpic plant. The tetrasporangia are born in the subepidermal tissues and are tripartite or cruciate. They are scattered irregularly over the plant.

Rhodymenia palmata (L.) Greville.

On rocks in the upper sublitoral zone. Popof Island, Kukak Bay, Prince William Sound, Yakutat Bay, and Glacier Bay, Alaska, *Saunders* (1901, p. 436); Esquimalt and the Strait of Juan de Fuca, B. C., *Harvey* (1862, p. 171).

These references are evidently all to the f. *typica*, that of Harvey probably mostly to subf. *nuda*, while those of Saunders refer both to that subform and subf. *marginifera*. The specimens examined by us have been referred to their proper subforms as follows.

Rhodymenia palmata f. typica subf. nuda Kjellman.

On stones in the lower litoral and upper sublitoral zones. Amaknak Island, Bay of Unalaska, Alaska, *W.A.S. and A.A.L.*, Nos. 3264!, 5000!, and in Collins, Holden and Setchell, P. B.-A., No. 936!; Karluk, Kadiak Island, Alaska, *W.A.S.*, No, 5064!; Uyak Bay, Kadiak Island, Alaska, *W.A.S. and A.A.L.*, No. 5079b!

Apparently perfectly typical of this form. It is a cartilaginous, thick, deep red form without marginal proliferations.

Rhodymenia palmata f. **typica** subf. **marginifera** Harvey.

On rocks in the middle litoral zone. Near Iliuliuk, Unalaska, Alaska, *W.A.S. and A.A.L.*, No. 5007!, *Postels and Ruprecht* (1840, p. 18).

Similar to the last in texture, usually of a paler color, and with the characteristic proliferations from the margins.

Rhodymenia palmata f. **typica** subf. **linearis** Setchell and Gardner subf. nov.

Fronds gregarious, simple, without proliferations, elongated linear-lanceolate, 30–65 cm. long and 1–2 (occasionally up to 3) cm. wide; substance cartilaginous; color deep red.

On rocks in the upper sublitoral zone. Yakutat Bay, Alaska, *Rev. Albin Johnson*, No. 5709!

An extraordinary variation of this form. Mr. Johnson says that it is eaten by the natives at Yakutat Bay and that the Thlinket name is "Raa-ts."

Rhodymenia palmata f. **mollis** Setchell and Gardner f. nov.

Fronds gregarious, simple or palmately lobed or cleft, more or less linear-lanceolate to broadly ovate in general outline, 20–40 cm. long and 5–15 cm. wide, dull reddish purple in color, and of more or less fleshy consistency. Tetraspores commonly present, cruciate, situated among the filaments of the outer layer.

On rocks, forming a zone at low water mark. Agattu Island, Alaska, *Townsend*, No. 5759!; Bay of Unalaska, Alaska, *W.A.S. and A.A.L.*! (a fragment); Esquimalt, B. C., *Tilden*, No. 304!, under *Grateloupia Cutleriæ*; west coast of Whidbey Island, Wash., *N.L.G.*, Nos. 178!, 181!, 623!, and in Collins, Holden and Setchell, P. B.-A., No. 934!

This form is very different from f. *typica* in color and consistency, but resembles it closely in shape. In structure, too, the two forms are very similar, but f. *mollis* is very commonly tetrasporic, while our specimens of f. *typica* are largely sterile. The base of f. *mollis* is more cartilaginous than the portions

above and, consequently, often persists after the upper parts are worn away. It is fairly common in various localities in Puget Sound, for one of us (N.L.G.) has found it on the Washington side of the Strait of Juan de Fuca, near Port Townsend, and on San Juan Island. We have collected specimens which we are inclined to refer to this form on the Californian coast near San Francisco and near Monterey. These more southern forms proliferate more commonly than the northern forms. This form is known as "Dulse" to many people in the Puget Sound region and is collected, particularly by the Canadian residents, in some quantity, and used as a relish.

Rhodymenia palmata f. Sarniensis (Mertens) J. Agardh.

On rocks, forming a zone in the middle litoral zone. Karluk, Kadiak Island, Alaska, *W.A.S.*, No. 5065!; Uyak Bay, Kadiak Island, Alaska, *W.A.S. and A.A.L.*, No. 5076!, and in Collins, Holden and Setchell, P. B.-A., No. 935!; St. Paul, Kadiak Island, Alaska, *W.A.S. and A.A.L.*, No. 5144!; Orca, Alaska, *W.A.S. and A.A.L.*, No. 5166!

The plants placed under this form are very distinct from the preceding forms of this species, but intergrade with them. It is near to f. *sobolifera* (Fl. Dan.) J. Agardh, which, if distinct from this, may possibly be found among the plants referred here.

Rhodymenia Palmetta (Esper) Greville.

Strait of Juan de Fuca, B. C., *Harvey* (1862, p. 171).

Known to us only from this reference.

Rhodymenia corallina (Bory) Greville.

Reported as growing in 14 fathoms of water in the Strait of Juan de Fuca, on the British Columbia side, by Harvey (1862, p. 171), with some doubt as to the determination.

Lomentaria ovalis f. subarticulata (Turner) Harvey.

Nootka Sound, B. C., *Menzies* (Turner, 1809, p. 24, pl. 81, under *Fucus ovalis* var. *subarticulatus*); Tracyton, Kitsap County, Wash., *Tilden*, No. 214!, under *L. ovalis* var. *Coulteri;* East Sound, Orcas Island, Wash., *N. L. G.*!

Apparently a rare plant in our territory.

Plocamium violaceum Farlow.

Port Renfrew, B. C., *Butler and Polley*, No. 33!

Determined by F. S. Collins.

Plocamium coccineum (Hudson) Lyngbye.

On rocks and algæ in the upper litoral zone. Puget Sound, *Bailey and Harvey* (1862, p. 161); Strait of Juan de Fuca, B. C., *Harvey* (1862, p. 171); Port Renfrew, B. C., *Butler and Polley*, Nos. 34, 36, and in Collins, Holden and Setchell, P. B.-A., No. 994d!; west coast of Whidbey Island, Wash., *N.L.G.*, Nos. 39!. 73!

Plocamium coccineum f. uncinatum J. Agardh.

In the sublitoral zone. Sitka, Alaska, *Saunders* (1901, p. 436).

Halosaccion glandiforme (Gmelin) Ruprecht.

An extended study of the saccate species of this genus has convinced us that, so far as the North Pacific species are concerned, the characters depended upon for separation from one another may be ascribed to difference of age, habitat, etc., and it has seemed best, consequently, to consider them all as belonging to one polymorphous species. We are not able even to divide this mass of forms into satisfactory groups and follow Ruprecht in adopting Gmelin's name as the earliest. We shall not attempt to give any complete view of the synonymy, at this time, but much of it may be found in Ruprecht's able discussion of the genus (1851, pp. 179–295). We shall arrange the references to localities in our territory under the specific names used as follows:—

Halosaccion glandiforme f. *coriaceum*. Kadiak Island and Unalaska (?), Alaska, *Ruprecht* (1851, p. 292).

Halosaccion glandiforme f. *genuinum*. Kadiak Island, Alaska, *Ruprecht* (1851, p. 293).

Halosaccion glandiforme f. *Menziesii*. Nootka Sound, B. C., *Ruprecht* (1851, p. 293).

Halosaccion glandiforme f. *soboliferum*. Sitka, Alaska, *Ruprecht* (1851, p. 292).

Halosaccion fucicola. Unalaska and Sitka, Alaska. *Ruprecht* (1851, pp. 289, 293); Popof Island, Prince William Sound, Sitka, and Annette Island, Alaska, and Victoria, B. C., *Saunders* (1901, p. 436).

Halosaccion fucicola f. *radicans.* Unalaska, Alaska, *Ruprecht* (1851, p. 293).

Halosaccion fucicola f. *decapitatum.* Kadiak Island and Sitka, Alaska, *Ruprecht* (1851, p. 293).

Fucus saccatus. Nootka Sound, B. C., *Turner* (1819, p. 104).

Halosaccion Hydrophora. Puget Sound, *Bailey and Harvey* (1862, p. 162); Esquimalt, B. C., and Strait of Juan de Fuca, *Harvey* (1862, p. 162).

Halosaccion firmum. St. Lawrence Island, Alaska, *Kjellman* (1889, p. 29); Cook Inlet, Alaska, *Saunders* (1901, p. 436).

Dumontia fucicola. Sitka, Alaska, *Postels and Ruprecht* (1840, p. 19).

Dumontia decapitata. Sitka, Alaska, *Postels and Ruprecht* (1840, p. 19).

The specimens examined by us may be reported as follows:—

On rocks and algæ in the litoral zone. Agattu Island, Alaska, *Townsend*, No. 5758!; west shore of Amaknak Island, Bay of Unalaska, Alaska, *W.A.S. and A.A.L.*, No. 3266!; Bay of Unalaska, Alaska, *W.A.S. and A.A.L.*, Nos. 4051!, 4061!; Harvester Island, Uyak Bay, Kadiak Island, Alaska, *W.A.S. and A.A.L.*, No. 5115!; St. Paul, Kadiak Island, Alaska, *W.A.S. and A.A.L.*, No. 5147!; Yakutat Bay, Alaska, *Rev. Albin Johnson*, No. 5704!; Port Renfrew, B. C., *Tilden*, No. 511!, under *H. fucicola*, *Butler and Polley*, Nos. 10, 105; west coast of Whidbey Island, Wash., *N.L.G.*, Nos. 4!, 285!; San Juan Island, Wash., *N.L.G.*, 108!, *Tilden*, No. 242!, under *Adenocystis Lessonii.*

Halosaccion glandiforme, in our extended sense, ranges from the Sea of Ochotsk to the east and southeast along the coasts of North America down to the northwestern coast of Mexico. The typical form is a large finger-shaped sack filled, when fresh, with water. There are microscopical openings at the tip or near it so that when one compresses the sack below, the water spurts out

in a number of very fine jets. This fact is mentioned by Turner (1819, p. 104) who quotes from the description of Tilesius of *Fucus saccatus*, and by Ruprecht (1851, p. 283). This is possible only when the plant is young. As the plant becomes older, the walls of the sack thicken, the color becomes darker, or else fades, and the tip is torn away or eroded, and the whole sack or a portion of it becomes filled with sand. All of these changes due to age, and the variability in color and size have brought about the considerable and vexatious synonymy.

Halosaccion ramentaceum (L.) J. Agardh.

In the litoral and upper sublitoral zones, on rocks and algæ. Sannak Island, Alaska, *Turner* (1886, p. 85, specimen in Herb. D. C. Eaton!); Kukak Bay, and Cook Inlet, Alaska, *Saunders* (1901, p. 436); Yakutat Bay and Glacier Bay, Alaska, *Saunders* (1901, p. 436, under *H. microsporum*).

We feel certain that *H. microsporum* is to be included under *H. ramentaceum* and have, in consequence, placed the two sets mentioned by Saunders under the one name, although we have not seen any of his *H. microsporum*.

Halosaccion Tilesii Kjellman.

In the litoral zone. Kukak Bay, Prince William Sound, Yakutat Bay, and Wrangell, Alaska, *Saunders* (1901, p. 436).

We have not seen any of the plants referred by Saunders to this species. The species occurs in two forms at Bering Island, Siberia, and as Kjellman has defined it, it is to be distinguished from the preceding species by its di- to polychotomous branching. Kjellman's figures (1889, pl. 1, f. 16–19), however, seem to represent a flat plant, tubular only at the base, and resemble very much the plants we have referred to *Rhodymenia palmata* f. *Sarniensis*.

Halosaccion coronatum (P. & R.) Kuetzing.

The *Dumontia coronata* and the *D. Clava* of Postels and Ruprecht, given as occurring among algæ of the Russian shores of the North Pacific Ocean, are puzzles. Ruprecht (1851, p. 286) says that they show no algal structure and is inclined to refer them to the animal kingdom, while *D. furcata* P. & R. is *Gloiopeltis furcata*.

Family DELESSERIACEÆ.

Nitophyllum Harveyanum J. Agardh.

Puget Sound, *Nott* (1900, p. 31).

Known only by a single specimen from our territory. The species is Australian, and also occurs locally in several localities on the Central Californian coast.

Nitophyllum latissimum (Harvey) J. Agardh.

On stones and wood in the lower litoral and upper sublitoral zones. Esquimalt, B. C., *Harvey* (1862, p. 170, under *Hymenena latissima*); west coast of Whidbey Island, Wash., *N.L.G.*, No. 93!; Port Orchard, Kitsap County, Wash., *Tilden*, No. 212!

A variable species, especially as to outline, prominence or obsolescence of the veins, color, etc. Miss Tilden's specimen is very fragmentary, representing a proliferation of an old plant, but seems to belong here. Harvey's plants, the types, are separated into two species by J. G. Agardh, the second of which is his *N. stenoglossum* (cf. J. Agardh, 1898, p. 92), but which we are inclined to refer to *N. violaceum*. Gardner's plant belongs to the *N. macroglossum* of J. Agardh, but, as Nott has already shown, is probably only a seasonal variation of *N. latissimum* (cf. Nott, 1900, pp. 19, 20).

Nitophyllum Ruthenicum (P. & R.) Kjellman.

On various Laminariaceæ in the sublitoral zone. St. Paul Island, Alaska, Herb. Farlow, legit *White*! (Setchell, 1899, p. 594); Sitka, Alaska, *Saunders* (1901, p. 437); west coast of Whidbey Island, Wash., *N.L.G.*, Nos. 114!, 115!, 266!.

This species is intermediate between what passes for *N. Fryeanum* and *N. spectabile* D. C. Eaton. The veins are inconspicuous and often scanty, and confined, as a rule, to the very base of the frond. Saunders (loc. cit.) speaks of this species as being intermediate between *N. latissimum* and *N. Fryeanum*. We have compared our specimens with specimens kindly sent by Professor Kjellman, and can find nothing in common with *N. latissimum*.

Nitophyllum violaceum J. Agardh.

On rocks in the lower litoral and upper sublitoral zones. Vancouver Island (probably at Esquimalt), B. C., *J. G. Agardh* (1898, p. 92, under *N. stenoglossum*); Port Renfrew, B. C., *Tilden*, No. 321! under *N. multilobum*.

A very variable species as regards habit and somewhat as regards color. As the sori appear in almost all younger plants on the margins and even on the surfaces of the lobes, appearing later on marginal leaflets, it does not seem desirable to remove this species from Nitophyllum and place it in Botryoglossum as DeToni has done. Miss Tilden's plant, although cystocarpic, seems clearly of this species, and would probably have been referred to *N. stenoglossum* by J. G. Agardh.

Nitophyllum Ruprechtianum J. Agardh.

On other algæ in the upper sublitoral zone. St. Paul Island, Alaska, *Greeley and Snodgrass*, No. 5802! (Setchell, 1899, p. 594); Norfolk Sound (near Sitka), Alaska, *Postels and Ruprecht* (1840, p. 15, under *Hymenena fimbriata*); Victoria and Esquimalt, B. C., *Harvey* (1862, p. 170, under *Hymenena fimbriata*); Port Renfrew, B. C., *Butler and Polley*, Nos. 22, 108, and in Collins, Holden and Setchell, P.B.-A., No. 937!; Puget Sound, *Bailey and Harvey* (1862, p. 161, under *Hymenena fissa* and *Botryocarpum platycarpum*); west coast of Whidbey Island, Wash., *N.L.G.*, No. 267!; Port Orchard, Kitsap County, Wash., *Tilden*, No. 213!

N. Ruprechtianum is another species, in which the sori are arranged differently in the younger from what they are in the older plants. At the tips, the sori commonly form flabellate lines along the veins in the substance of the fronds. This is the *N. flabelligerum* J. Agardh, and is represented by No. 108 from Port Renfrew. Later, the sori occupy marginal leaflets. Consequently, there seems to be no reason for placing this species under Botryoglossum as DeToni has done.

Delesseria intermedia J. Agardh.

Vancouver Island, B. C., *J. G. Agardh* (1870, p. 55).

Known to us only from Agardh's description.

Delesseria sinuosa (Goodenough and Woodward) Lamouroux.

Arctic coast of Alaska, *Harvey* (1872, p. 463); Agattu Island, Alaska, *Townsend*, No. 5764!; shores of the Bay of Unalaska, Alaska, *W.A.S. and A.A.L.*, Nos. 3274!, 4038!, 4064a!, 5005!; Shumagin Islands, Alaska, *Saunders* (1901, p. 437); Karluk, Kadiak Island, Alaska, *W.A.S.*, No. 5063!; Cormorant Rocks, Uyak Bay, Kadiak Island, Alaska, *W.A.S. and A.A.L.*, No. 5134!; Kukak Bay, Prince William Sound, and Sitka, Alaska, *Saunders* (1901, p. 437).

The specimens examined by us, of those enumerated above, show more or less proliferation, and in most cases, they are eroded to the costa and ribs which are bare or nearly bare of blade, but covered with smaller or larger proliferous leaflets. Unfortunately, none of the specimens have either tetraspores or cystocarps, and consequently we cannot be so certain as to the specific determination as we desire. Our specimens are placed here on account of the tendency to proliferate. We do not feel certain of Saunders's conception of the species, since he says (loc. cit.):—"a very variable species, some of the forms resembling *D. quercifolia* but with a more distinct midrib and opposite nerves." *D. quercifolia*, however, has a fairly distinct midrib and the nerves are opposite.

Delesseria sinuosa f. **lingulata** Agardh.

Upper sublitoral zone. St. Lawrence Island, Alaska, *Kjellman* (1889, p. 25).

Kjellman found the f. *typica* at Bering Island, Siberia, and these specimens bore cystocarps, while the St. Lawrence Island specimens bore tetrasporangia.

Delesseria crassifolia Ruprecht.

St. Paul Island, Alaska, *Ruprecht* (1851, p. 232), *Farlow* (1886, p. 473), *Townsend*, No. 5779!, *Greeley and Snodgrass*, No. 5803! (Setchell, 1899, p. 594), *Saunders* (1901, p. 437).

A fine large species and apparently commonly cast ashore at St. Paul Island in the Pribilof group. It seems close to *D. Middendorfii* Ruprecht, but is less proliferous from the costa.

Schizoneura quercifolia f. **linearis** Collins comb. nov.

On stipes of Lessonia in the upper sublitoral zone. Port Renfrew, B. C., *Butler and Polley*, in Collins, Holden and Setchell, P. B.-A., No. 938!

Collins has distributed the specimens collected at Port Renfrew under the name of *Delesseria quercifolia* f. *linearis*. The plants look like eroded and less proliferous forms of the Unalaska plants which we have referred to *D. sinuosa*. In general outline and venation, these several plants resemble *S. quercifolia* very much, but that species as found on the coast of California does not show, in the specimens seen by us, any tendency towards proliferation. As none of the specimens are in fruit, we must leave them as given here.

Erythroglossum Woodii J. Agardh.

Vancouver Island, B. C., *J. G. Agardh* (1870, p. 54, under *Delesseria Woodii*).

We have not seen any specimen which may be referred to this species. According to the description, it has a narrow, linear frond (2–3 mm. wide), pinnately branched, with interrupted, linear, marginal sori.

Apoglossum decipiens J. Agardh.

Upper sublitoral zone. Prince William Sound, Alaska, *Saunders* (1901, p. 437, under *Delesseria decipiens*); Vancouver Island, B. C., *J. G. Agardh* (1870, p. 58, under *Delesseria decipiens*); Strait of Juan de Fuca, B. C., *Harvey* (1862, p. 170, under *D. Hypoglossum* var. *arborescens*); Whidbey Island, Wash., *N.L.G.*, No. 6!; San Juan Island, Wash., *Tilden*, No. 211!, under *D. decipiens*.

A large and beautiful species with both cystocarps and tetraspores in abundance, extending southward to the central coast of California.

Pteridium Bærii (Ruprecht) J. Agardh.

In the sublitoral zone. Sitka, Alaska, *Saunders* (1901, p. 437, under *D. Bærii*).

This species occurs in the Ochotsk Sea, but the above is the only locality as yet noted for it on the West American Coast.

Pteridium Juergensii J. Agardh.

St. Paul Island, Alaska, *Ruprecht* (1851, p. 245, under *Delesseria complanata*), *Farlow* (1886, p. 473. under *D. Juergensii*); Unalaska, Alaska, *Ruprecht* (1851, p. 245, under *D. complanata*); Sannak Island, Alaska, *Turner* (1886, p. 85, under *D. Juergensii*).

We have not seen a specimen.

Pteridium spinulosum (Ruprecht) J. Agardh.

St. Paul Island, Alaska, *Ruprecht* (1851, p. 244, under *D. Beeringiana* f. *spinulosa*); Bay of Morozof (Morzhovoi Bay), Alaska, *Townsend*, No. 5776!

We have ventured to refer here a narrow, sterile plant, but not without some doubt. J. G. Agardh (1876, p. 483) leaves it to be understood that he knows nothing of the sori of this species and DeToni (1900, p. 714) says: "fructibus ignotis," but Ruprecht says distinctly (1851, p. 244), that the somewhat young tetraspores, in a specimen from St. Paul form a long line, on each side of the midrib, extending from near the base of a branch very nearly to the tip.

Pteridium alatum (Hudson) J. Agardh.

Victoria, B. C., *Saunders* (1901, p. 437, under *Delesseria alata*); on stems of Nereocystis, probably near Esquimalt (no special locality given). B. C., *Harvey* (1862, p. 437, under *D. alata* var. *latissima*).

We have seen no specimens of this species from our territory and simply quote the above localities. The narrow Delesserieæ of our coast need more careful study and revision.

Pteridium? serratum (P. & R.) DeToni.

St. Paul Island, Alaska, *Ruprecht* (1851, p. 245, under *Delesseria serrata*); Unalaska, Alaska, *Postels and Ruprecht* (1840, p. 15, under *D. serrata*); Alaska, *Saunders* (1901, p. 438, under *D. serrata*).

Ruprecht states that his plants grew generally on *Ptilota Asplenioides*, but Saunders gives neither habitat nor exact locality.

Pteridium? serratum f. **platyphyllum** Setchell and Gardner f. nov.

Fronds up to 10 cm. high, subdichotomous below, regularly alternately pinnate above, rose red, linear, entire, with prominent midrib and microscopic lateral veins. The width varies from 5 mm. in the lower part, to 2 mm. just below the tips of the branches. Sori on each side of the midrib and ascending along the microscopic veins, continuous from near the base to just below the tips. Cystocarps?.

On a wooden float. Pleasant Beach, Kitsap County, Wash., *N.L.G.*, No. 344!

Answering very well to the description of *Pt. serratum*, except that the frond is twice as wide and the margins smooth. The plant has the color and consistency of *Apoglossum decipiens*, but differs decidedly in its method of branching (we have seen no proliferations of any kind) and the position of the sori. We have seen what appears to be the same form from Santa Cruz, California, collected by Dr. C. L. Anderson. We refer this form to *Pteridium serratum* with considerable doubt, since we have been unable to examine a specimen of that species.

Family BONNEMAISONIACEÆ.

Bonnemaisonia hamifera Hariot.

In the upper sublitoral zone. West coast of Whidbey Island, Wash., *N.L.G.*, No. 25!, and in Collins, Holden and Setchell, P. B.-A., No. 939!

This species varies very much in breadth and the frequency of the circinate branchlets. Some specimens are as much as 6 mm. broad, while others are not over 1.5 mm. even in the broadest portions. The Whidbey Island specimens show cystocarps, antheridia, and tetrasporangia. It is to be found from May until August.

Family RHODOMELACEÆ.

Laurencia pinnatifida (Gmelin) Lamouroux.

On rocks in the lower litoral and upper sublitoral zones. Norfolk Sound (near Sitka), Alaska, *Postels and Ruprecht* (1840, p. 16, under *L. spectabilis*); Strait of Juan de Fuca and Victoria, B. C., *Harvey* (1862, p. 169); Port Renfrew, B. C., *Tilden*, No. 320!, *Butler and Polley*, No. 116; west coast of Whidbey Island, Wash., *N.L.G.*, No. 449!

A common species of the coast of California.

Janczewskia verrucæformis Solms.

Parasitic on the fronds of the preceding species. West coast of Whidbey Island, Wash., *N.L.G.*, No. 449a!

Not uncommon on the coast of California.

Chondria atropurpurea Harvey.

Strait of Juan de Fuca, B. C., *Harvey* (1862, p. 168).

Known from our territory only from this reference.

Polysiphonia atrorubescens (Dillwyn) Greville.

In the sublitoral zone (10 fathoms). Strait of Juan de Fuca and Esquimalt, B. C., *Harvey* (1862, p. 168).

We have not seen any specimens referable to this species.

Polysiphonia atrorubescens f. **minor** Harvey.

Orcas Island, Wash., *Harvey* (1862, p. 168).

Polysiphonia nigrescens f. **Fucoides** Harvey.

Sitka, Alaska, *Harvey* (1852, p. 50).

Polysiphonia urceolata (Lightfoot) Greville.

On boulders near low water mark. Strait of Juan de Fuca, Point Roberts, and Esquimalt, B. C., *Harvey* (1862, p. 169); west coast of Whidbey Island, Wash., *N.L.G.*, Nos. 224!, 225!, 409!; Channel Rocks, near Seattle, Wash., *N.L.G.*, No. 349!

The specimens examined have no leaves and seem to correspond in every way to the description of this species.

Polysiphonia senticulosa Harvey.

Orcas Island, Wash., *Harvey* (1862, p. 169).

This is the type locality for this species. We have seen no plants from our territory which we can refer to it. The species is placed near *P. urceolata* by J. G. Agardh (1863, p. 974), but is to be distinguished by the terminal branchlets being densely pinnately virgate. If the specimen distributed in Collins, Holden and Setchell's Phycotheca Boreali-Americana (No. 638) is correctly determined, this species differs from the last, not only in the last mentioned particulars, but also in having short but well developed leaves towards the tips both of the main shoot and of the lateral axes.

Polysiphonia Californica Harvey.

On rocks and wood, upper sublitoral zone. Esquimalt, B. C., *Harvey* (1862, p. 168); Whidbey Island, Wash., *N.L.G.*, Nos. 127!, 297!; San Juan Island, Wash., *Tilden*, No. 316!, under *P. atrorubescens;* Pleasant Beach, Kitsap County, Wash., *N.L.G.*, No. 347!; Tracyton, Kitsap County, Wash., *Tilden*, No. 210!, under *P. bipinnata*.

We have made a careful examination of all specimens from our territory with many pericentral cells, accessible to us, of the species of Polysiphonia as limited by Falkenberg (1901). The specimens referred to the present species all agree in having monosiphonous, colorless, simple branchlets (simple leaves?) near the tips of the young axes as Falkenberg has indicated for the type (1901, p. 274). In habit and other details of structure, the plants referred here seem to agree well with the description of Harvey (1852, p. 58) and they also agree well with plants collected by us near the type locality and referred here. The relation between this species and *P. atrorubescens* and *P. nigrescens* seem likely to be close, but the simple leaves and some differences of habit prevent our referring the specimens to either of these species at present.

Polysiphonia Californica var. plumigera Harvey.

Point Roberts, B. C., *Harvey* (1862, p. 168).

Pterosiphonia bipinnata (P. & R.) Falkenberg.

On rocks and algæ in the litoral and upper sublitoral zones. Cape Nome, Alaska, *W.A.S.*, No. 5732! (cast ashore); St. Michael, Alaska, *W.A.S.*, No. 5242x!, in Herb. *D. C. Eaton*, No. 13!; west shore of Amaknak Island, Bay of Unalaska, Alaska, *W.A.S. and A.A.L.*, No. 3257!; near Iliuliuk Unalaska, Alaska, *W.A.S. and A.A.L.*, Nos. 4054b!, 5009!, 5014!; Uyak Bay, Kadiak Island, Alaska, *W.A.S. and A.A.L.*, No. 5094!; Harvester Island, Uyak Bay, Kadiak Island, Alaska, *W.A.S. and A.A.L.*, Nos. 5108!, 5135!; St. Paul, Kadiak Island, Alaska, *W.A.S. and A.A.L.*, No. 5143!; Orca, Alaska, *W.A.S. and A.A.L.*, No. 5163!; Port Renfrew, B. C., *Butler and Polley!;* Whidbey Island, Wash., *N.L.G.*, No. 20!; San Juan Island, Wash., *N.L.G.*, No. 211!, *Tilden*, No. 318!, under *P. nigrescens*.

Besides the localities given above, from which we have carefully studied specimens, Saunders has given (1901, p. 438) the following localities for *P. bipinnata*: Yakutat Bay, Glacier Bay, Sitka, and Annette Island, Alaska. We have segregated the last localities, since there has been some confusion as to the real plant of Postels and Ruprecht, but Falkenberg (1901, pp. 273, 274) has indicated the structure and removed from it *Polysiphonia Californica* Harvey which has commonly been referred to it as a synonym on the authority of J. G. Agardh. The type is a leafless, slightly or not at all flattened species with distichously pinnate branching, at least in the upper portions. The pericentral cells vary from 11 to 18.

Pterosiphonia dendroidea (Montagne) Falkenberg.

On rocks and algæ in the lower litoral and upper sublitoral zones. Esquimalt, B. C., *Harvey* (1862, p. 168, under *Polysiphonia dendroidea*); west coast of Whidbey Island, Wash., *N.L.G.*, Nos. 176!, 237!, 238!, 511a!

A very distinct species sometimes placed under *Pol. parasitica* as a variety, but kept distinct by Falkenberg. What appear to be younger specimens have sometimes been referred to *Pterosiphonia pennata* (Roth) Falkenberg, and Falkenberg (1901, p. 264) has seen a specimen from San Simeon Bay, San Luis Obispo County, Cal., which may be the Peruvian *Pol. spinifera* Kuetzing.

Pterosiphonia Woodii (Harvey) Falkenberg.

On the stipes of Pleurophycus and other kelps in the upper sublitoral zone. Port Renfrew, B. C., *Butler and Polley*, No. 1!; west coast of Whidbey Island, Wash., *N.L.G.*, Nos. 12!, 38!

More or less common on the shores of California.

Pterosiphonia arctica (J. Agardh) Setchell and Gardner comb. nov. Plate 19.

On large algæ in the upper sublitoral zone or floating. Near Iliuliuk, Unalaska, Alaska, *W.A.S. and A.A.L.*, No. 5002!; Shumagin Islands, Alaska, *Saunders* (1901, p. 438, under *Polysiphonia arctica*); west coast of Whidbey Island, Wash., *N.L.G.*, Nos. 59!, 226!, 227!, 413!, 511!

We are uncertain as to the type of *Polysiphonia arctica* J. Agardh, but we have been able to compare ours with a specimen from Rosenvinge, through the kindness of F. S. Collins. This specimen was old and battered and there was difficulty in obtaining good tips. Ours seemed to be very close to it and consequently we have placed it under this name. Our plants vary much in coarseness, are plainly distichous near the tips, have constantly six or seven pericentral cells, and have the tips mucronate and devoid of hairs. Our figures show the Alaskan specimens which are coarser than those from Puget Sound. We have not seen the plant of Saunders. Our plants are certainly good species of Pterosiphonia as Falkenberg has described the genus.

Lophosiphonia obscura (Agardh) Falkenberg.

On sand covered rocks in the litoral zone. San Juan Island, Wash., *Tilden*, No. 317, under *Polysiphonia bipinnata* f. *psammicola*. atro-rubescens

This species is quite common on the coast of California. It answers well to the descriptions of this species and has been compared with European specimens by F. S. Collins.

Lophosiphonia villum (J. Agardh) Setchell and Gardner comb. nov.

On Fucus, lower litoral zone. St. Paul, Kadiak Island, Alaska, *W.A.S. and A.A.L.*, No. 5138!

A single plant, looking so much like a luxuriant Rhodochorton that at first it was taken for one, resembles so closely what we have considered to be *Polysiphonia villum* on the Californian coast that it is referred to the same species. The *P. villum* of J. G. Agardh is undoubtedly a Lophosiphonia as established by Falkenberg, and, consequently, we are compelled to place the species under that genus. Our Alaskan plant is the same as No. 246 of Collins, Holden and Setchell, P. B.-A., but is not the same as the *Pol. villum*, No. 134 *bis* of Farlow, Anderson and Eaton, Alg. Exsicc. Am. Bor. Our plants have no leaves, while the last mentioned plant has well developed leaves at the bases of the secondary branches. We are uncertain as to which, if either, of these plants is the type, but believe that ours corresponds more nearly to the description. In our plant, the creeping, rhizoid-bearing stem bears longer or shorter branches along the upper surface. The branches are sparingly branched, in turn, and are endogenous in origin. The tips are attentuate and slightly recurved, bearing no hair like growths.

Rhodomela Larix (Turner) Agardh.

On rocks, on exposed shores in the litoral zone. St. Paul Island, Alaska, *Ruprecht* (1851, p. 219, under *Fuscaria Larix*); west coast of Amaknak Island, Bay of Unalaska, Alaska, *W.A.S. and A.A.L.*, No. 3251!; Unalaska and Norfolk Sound (Sitka), Alaska, and Nootka Sound, B. C., *Postels and Ruprecht* (1840, p. 14); Nootka Sound, B. C., *Turner* (1819, p. 23, pl. 207, under *Fucus Larix*); Puget Sound, *Bailey and Harvey* (1862, p. 160); Point Roberts, Strait of Juan de Fuca, and Esquimalt, B. C., *Harvey* (1862, p. 168); Port Renfrew, B. C., *Butler and Polley*, No. 4; west coast of Whidbey Island, Wash., *N.L.G.*, No. 46!; San Juan Island, Wash., *Tilden*, No. 209!

A robust species with the branchlets arising spirally on the main axes and to be distinguished from the various forms of *Odonthalia floccosa* by this character. Turner's figure (1819, pl. 207, f. a.) of the habit represents a plant rather more pinnate than any seen by us, but otherwise our plants are in agreement with it. The figure of Postels and Ruprecht (1840, pl. 38, f. h.) is small but represents a typical plant. Kuetzing's figure (1865,

pl. 39, f. a.), however represents, as it seems to us, a form of *Odonthalia floccosa*. This species is very common along the coast of California.

Rhodomela Lycopodioides f. Cladostephus (J. Agardh) Kjellman.

On stones in quiet water, upper sublitoral zone. East shore of Amaknak Island, Bay of Unalaska, Alaska, *W.A.S. and A.A.L.*, No. 4079!; Yakutat Bay, Alaska, *Rev. Albin Johnson*, No. 5706!

We have found a number of forms of a species which cannot be referred to *R. Larix* or to *Odonthalia floccosa* and, after careful study, we are convinced that all, or perhaps nearly all, are to be referred to *R. Lycopodioides*. They are puzzling forms and we are occasionally in some considerable doubt about some particular plant. Kjellman's account in the Algæ of the Arctic Sea has been of great help and we have referred our forms much as he has done. The present form is a coarse one and may have passed as a slender form of *R. Larix*. It differs from that species in being more regularly and more pinnately branched and has a much more regular distribution of branchlets.

Rhodomela Lycopodioides f. typica subf. compacta Kjellman.

On stones in the middle litoral zone. St. Paul, Kadiak Island, Alaska, *W.A.S. and A.A.L.*, Nos. 5142! (cystocarpic!), 5146! (tetrasporic!).

This form is less coarse, not so rigid and wiry, and less Cladostephus-like than the last, but it is decidedly more densely provided with branchlets than the next. It has the intensely black color, when dried, common to all the members of this group of forms.

Rhodomela Lycopodioides f. typica subf. laxa Kjellman.

On rocks in the litoral zone. St. Paul Island, Alaska, *Greeley and Snodgrass*, No. 5796a!; Bay of Unalaska, Unalaska, Alaska, *W.A.S. and A.A.L.*, No. 5017a!; Uyak Bay, Kadiak Island, Alaska, *W.A.S. and A.A.L.*, No. 5074!; Orca, Alaska, *W.A.S. and A.A.L.*, No. 5162!; Yakutat Bay, Alaska, *Rev. Albin Johnson*, No. 5710!; Sitka, Alaska, *Ida M. Rodgers*, No. 5726!

This form, and, to some extent, the last, resembles some of the forms of *Odonthalia Aleutica*, but are more slender and have the branchlets even from the very first, spirally arranged. However, it is not always easy to determine this from dried specimens. We have examined carefully every specimen referred here and feel fairly certain that all belong under this name.

Rhodomela Lycopodioides f. typica subf. tenera Kjellman.

Golofnin Bay, Alaska, *R. C. McGregor*, No. 5674!

This plant agrees fairly well with Kjellman's figure of this form (1883, pl. 9, f. 2).

Rhodomela Lycopodioides f. flagellaris Kjellman.

Golofnin Bay, Alaska, *R. C. McGregor*, Nos. 5672!, 5677!

We refer here plants which seem to agree well with Kjellman's figure of this form (1883, pl. 10, f. 1).

Rhodomela Lycopodioides f. ramentacea Kjellman.

In the upper sublitoral zone. Port Clarence, Alaska, *Kjellman* (1889, p. 24); Golofnin Bay, Alaska, *R. C. McGregor*, No. 5675!

We refer the Golofnin Bay specimen here very doubtfully, since it is only a fragment, but it has something of the habit of *Chordaria abietina* described for this form.

Rhodomela Lycopodioides f. tenuissima (Ruprecht) Kjellman.

St. Lawrence Island and Port Clarence, Alaska, *Kjellman* (1889, p. 24, subf. *prolifera*); Cape Nome, Alaska, *W.A.S.*, No. 5731! (cast ashore); Golofnin Bay, Alaska, *R. C. McGregor*, No. 5666a!.

From f. *Cladostephus* to f. *tenuissima* is a very considerable jump and were it not for the intermediate forms, it would seem absurd to refer them both under one species. We have had little opportunity of studying this species otherwise than from dried specimens and can hardly express an opinion on this matter or on the relationship between these various forms and forms of *R. subfusca* (Woodward) Agardh.

Odonthalia Aleutica (Agardh) J. Agardh.

On rocks and algæ in the lower litoral and upper sublitoral zones. Unalaska, Alaska, *C. A. Agardh* (1820, pl. 5, under *Rhodomela Aleutica*); Shumagin Islands, Alaska, *Saunders* (1901, p. 438); St. Paul, Kadiak Island, Alaska, *W.A.S. and A.A.L.*, No. 5150!; Victoria, B. C., *Tilden*, No. 315!, under *Rhodomela floccosa* form b); Esquimalt, B. C., *Tilden*, No. 314! under *Rhodomela floccosa*; west coast of Whidbey Island, Wash., *N.L.G.*, Nos. 16!, 92!

This species is probably not uncommon along our northwestern coast from the Strait of Juan de Fuca to Unalaska. It is probably often confused with the next, but it is to be distinguished from it by the fact that the tetrasporic and cystocarpic branches are not shortened or collected into a glomerule, but are in a loose raceme. It is to be distinguished from coarser forms of the last species by its distichous branchlets.

Odonthalia floccosa (Esper) Falkenberg.

Unalaska and Sitka, Alaska, *Postels and Ruprecht* (1840, p. 14); Sannak Island, Alaska, *Turner* (1886, p. 85): Popof Island, Kukak Bay, Yakutat Bay, Sitka, Wrangell, and Annette Island, Alaska, *Saunders* (1901, p. 448); Strait of Juan de Fuca and Point Roberts, B. C., *Harvey* (1862, p. 167).

There has been much confusion in the specimens referred to this species. Postels and Ruprecht (1840, p. 14) include the preceding species and *Fucus pilulifer* Turner, both of which seem to us distinct. It has been confused with forms of *Rhodomela Lycopodioides*, etc., until it is difficult to determine from the references whether they refer to the species as Falkenberg has defined it or not. We have, therefore, given the references above without comment. We have found three forms standing out fairly distinctly from the mass of forms, viz.—f. *typica*, f. *comosa*, and f. *macracantha*, and have noted them below.

Odonthalia floccosa f. **typica** Setchell and Gardner nom. nov.

The typical form is represented by Esper (1802, pl. 130) and rather better by Turner (1808, pl. 8), under the name of *Fucus floccosus*. The type came from Port Trinidad, California,

according to Turner, who sent Esper his specimens, although the latter represents them as having been brought from Nootka Sound, B. C., by Cook. They were collected by Menzies according to Turner. This form is a slender form of the more southern waters, and we have not seen any characteristic specimens of it from our territory. No. 313 of Tilden's American Algæ, from San Juan Island, Wash., may represent this form, but the specimen is not very complete. Kuetzing's figure of *Lophura floccosa* (1865, pl. 38, c–e) may be of this form, but it is transitional to f. *macracantha*. *Fucus pilulifer* of Turner (1819, pl. 236) seems to us not to be of this species, but probably a much battered plant of *O. Aleutica*. It was collected at Nootka Sound, B. C., by Menzies.

Odonthalia floccosa f. **comosa** Setchell and Gardner f. nov. Plate 27.

A luxuriant form, near f. *typica*, but with the branchlets more numerous, longer, slender and recurved so as to give a compact, shaggy appearance to the whole plant. The collecting of the stichidia and cystocarpic branchlets into compact heads with involucre-like outer branchlets characteristic of the species, reaches its extreme in this form as may be seen from the figures on Plate 27. The distichous arrangement of the branchlets is to be seen plainly only at the very tip, and even there is often obscure, especially in dried specimens.

On exposed rocks in the litoral zone. Agattu Island, Alaska, *Townsend*, No. 5760!; west shore of Amaknak Island, Bay of Unalaska, Alaska, *W.A.S. and A.A.L.*, No. 3255!; near Iliuliuk, Unalaska, Alaska, *W.A.S. and A.A.L.*, No. 4037!; Uyak Bay, Kadiak Island, Alaska, *W.A.S. and A.A.L.*, No. 5090!; Port Renfrew, B. C., *Butler and Polley*!; west coast of Whidbey Island, Wash., *N.L.G.*, Nos. 29!, 96!

This form is sufficiently distinct in appearance to be told at a glance, but it is really only a more luxuriant form of the typical condition. It seems to be confused at times with *Rhodomela Larix*, but is distichous in its scheme of branchlets, less coarse and less rigid.

Odonthalia floccosa f. **macracantha** (Kuetzing) Setchell and Gardner comb. nov.

Lophura macracantha Kuetzing, Tabulæ Phycologicæ, Vol. 15, p. 14, pl. 39, d–g, 1865.

On rocks in the litoral zone. St. Paul Island, Alaska, *Greeley and Snodgrass*, No. 5796! (cf. Setchell, 1899, p. 594, under *Rhodomela floccosa*); west shore of Amaknak Island, Bay of Unalaska, Alaska, *W.A.S. and A.A.L.*, No. 3254!; Uyak Bay, Kadiak Island, Alaska, *W.A.S. and A.A.L.*, Nos. 5083!, 5085!; Harvester Island, Uyak Bay, Kadiak Island, Alaska, *W.A.S. and A.A.L.*, No. 5106!; Port Renfrew, B. C., *Butler and Polley*!

This is a coarser and laxer form than the preceding and is well represented by Kuetzing's figures. The glomerules of reproductive branchlets are distinct but not so dense as in f. *comosa*.

Odonthalia Lyallii (Harvey) J. Agardh. PLATE 27.

On different algæ, in the upper sublitoral zone. Strait of Juan de Fuca, B. C., *Harvey* (1862, p. 168, under *Rhodomela Lyallii*); west coast of Whidbey Island. Wash., *N.L.G.*, Nos. 3!, 126!, 161!, 193!, and in Collins, Holden and Setchell, P. B.-A., No. 940!; San Juan Island, Wash., *Tilden*, No. 319!, under *Laurencia Grevilleana*.

We have had considerable trouble in determining with any certainty, or at least satisfaction, the Odonthalias of our coast, and the present arrangement, while it seems to us to represent the case fairly well from the species point of view, must necessarily be provisional as far as the exact synonymy is concerned. The plant included under this name, is, we feel quite certain, the plant of Harvey. Besides the locality of Whidbey Island, Gardner has found it also near Port Townsend. The latter locality must be in the same immediate region whence the type specimen was obtained. The species, as it comes ashore, is frequently long (up to 45 cm. and probably even longer), without trace of midrib, with the cystocarps alternating and distant on unchanged pinnules, while the stichidia are placed more closely, but the rhachis is not appreciably abbreviated. These are shown in the figures on plate 27. The only species which seems to come near it is the next, but in that, the frond has a distinct midrib and the

reproductive organs are more fasciculate. The cystocarps too, in the next species, are calcarate, while those of *O. Lyallii* are ecalcarate. We have found old and complete specimens of *O. Lyallii* with a thickened stipe-like portion below, but even here, there is little midrib and the upper portion is entirely plane. Miss Tilden's specimen from San Juan Island probably belongs to this species, but may perhaps, judging from its color, more properly be placed under the next. Certainly it has nothing in common with *Laurencia Grevilleana* under which she has placed it.

Odonthalia Kamtschatica (Ruprecht) J. Agardh.

St. Paul Island, Alaska, *Ruprecht* (1851, p. 214, under *Atomaria Kamtschatica*); Sannak Island, Alaska, *Turner* (1886, p. 85); Unga, Alaska, *A.A.L.*, No. 5051!; Kukak Bay and Yakutat Bay, Alaska, *Saunders* (1901, p. 438); Port Renfrew, B. C., *Butler and Polley*, No. 102!; Vancouver Island, B. C., and Port Angeles, Clallam County, Wash., *G. W. Lichtenthaler*.

We have quoted the various published mentions of the occurrence of this species within our territory and have added two localities whence we have examined specimens. We feel much doubt in referring the specimens to this species; one is a sterile plant and, while the other has stichidia, the chief differences between them and the specimens from Whidbey Island, which we refer fairly confidently to the preceding species, is in the color (these being a dark red and those being a light brownish tint) and a tendency on the part of the specimens we refer to the present species to have a fairly prominent midrib in the lower portion of the frond. The figure of *O. angustifolia* Postels and Ruprecht (1840, pl. 27), which Ruprecht says is of this species and not of *O. angustifolia* Suhr, shows a sterile plant with a distinct midrib to very near the tips of the branches.

Odonthalia semicostata (Mertens) J. Agardh. Plates 26, 27.

On rocks in the upper sublitoral zone. Victoria, B. C., *Tilden*, No. 312!, under *Odonthalia dentata*; west coast of Whidbey Island, Wash., *N.L.G.*, Nos. 61!, 161a!, and in Collins, Holden, and Setchell, P. B.-A., No. 941!

A common species along the west coast of Whidbey Island and found cast ashore the year round. It seems to fruit about

the month of August, and bears both cystocarps and tetrasporangia in abundance. It approaches both *O. dentata* and *O. Kamtschatica*. From the former, it differs in having the branchlets dentiform to subulate and the cystocarps usually ecalcarate, while from the latter it differs in having the rhachis of the pinnule bearing either cystocarps or stichidia, abbreviated. Our plants differ from the description of J. G. Agardh (1863, p. 898) in being rather thicker in substance and darker in color. It is probable that many changes will be made in the names of the species of this genus when an opportunity is given for the study of our northwestern species in their habitats and a comparison with type specimens. Much confusion has already been produced, and one has only to compare the accounts of Ruprecht (1851) and J. G. Agardh (1863) to see how difficult it is likely to be to attempt to unravel completely the synonymy.

Odonthalia dentata (L.) Lyngbye.

Point Barrow, Alaska, *Farlow* (1885, p. 192); St. Lawrence Island, Alaska, *Kjellman* (1889, p. 24); Victoria, B. C., *Farlow* (1886, p. 470).

We have not seen any specimens referable to this species from our territory.

Odonthalia dentata f. angusta Harvey.

Arctic coast of Alaska, *Harvey* (1872, p. 463.)

Dasyopsis plumosa (Harvey and Bailey) Schmitz.

On wood and stones in the upper sublitoral zone. Puget Sound, *Harvey and Bailey* (1851, p. 371), *Bailey and Harvey*, (1862, p. 160), both under *Dasya* (*Stichocarpus*) *plumosa*; west coast of Whidbey Island, Wash., *N.L.G.*, Nos. 17!, 28!, 133!, and in Collins, Holden and Setchell, P. B.-A., No. 942!; Friday Harbor, San Juan Island, Wash., *N.L.G.*, No. 486!

A beautiful species, apparently not very common and occurring as far south as Monterey, California. We have examined both cystocarpic and tetrasporic plants from our territory.

Family CERAMIACEÆ.

Griffithsia ——— ?

Two different sets of plants are known to us from our territory, but neither possess reproductive organs of any kind, and are, consequently, indeterminable. They are as follows: On rocks, Tracyton, Kitsap County, Wash., *Tilden*, No. 208!, under *G. opuntioides*, and on piles, Keyport, Kitsap County, Wash., *N.L.G.*, No. 495! We find a species on the coast of California, which has also been referred to *G. opuntioides*. The Californian specimens are usually sterile, but we have seen some with tetrasporangia, and although cystocarps and antheridia are needed to complete the diagnosis, it seems to be new, certainly not the species to which it has been referred.

Pleonosporium Vancouverianum J. Agardh.

On stones in the upper sublitoral zone. Vancouver Island, B. C., *J. G. Agardh* (1876, p. 30, under *Callithamnion Vancouverianum*); Esquimalt, B. C., *Harvey* (1862, p. 175, under *Callithamnion thuyoideum*, fide J. G. Agardh, 1876, p. 30); East Sound, Orcas Island, Wash., *N.L.G.*, No. 501!; Friday Harbor, San Juan Island, Wash, *N.L.G.*, No. 506!

We have not been able to examine an authentic or type specimen of this species, but the specimens referred here seem to agree well with the description. Our plants agree well with the figure of *Callithamnion venustissimum* in Kuetzing's Tabulæ Phycologicæ (1862, pl. 1) which J. G. Agardh quotes under this species with a query. The habit is certainly close. The procarps in No. 506 are terminal and No. 501 has tetrasporangia with the contents divided into many spores.

Callithamnion polyspermum Agardh.

On membranous algæ. Esquimalt, B. C., *Harvey* (1862, p. 175); Vancouver Island, B. C., *J. G. Agardh* (1876, p. 32); west coast of Whidbey Island, Wash., *N.L.G.*, Nos. 163!, 619!

The Whidbey Island specimens referred here are done so with doubt. They are not well developed plants, but seem to belong here.

Callithamnion Baileyi Harvey.

On a wooden float, etc. West coast of Whidbey Island, Wash., *N.L.G.*, No. 221!; Friday Harbor, San Juan Island, Wash., *N.L.G.*, No. 504!

The plants seem to agree in all respects with all the figures, descriptions, and published specimens of this species. They are to be distinguished from the last two by the tapering mucronate tips of the branchlets. The branchlets have elongated cells, thus differing from *C. tetragonum* (Withering) Agardh. Our specimens possess tetrasporangia.

Ceratothamnion Pikeanum f. **laxum** Setchell and Gardner f. nov.

On vertical rocks exposed to the force of the waves, often under a covering of overhanging Fucus, in the litoral zone. Shumagin Islands, Alaska, *Saunders* (1901, p. 439, under the species); Harvester Island, Uyak Bay, Kadiak Island, Alaska, *W.A.S. and A.A.L.*, No. 5127!, and in Collins, Holden and Setchell, P. B.-A., No. 943!; Yakutat Bay and Sitka, Alaska, *Saunders* (1901, p. 439, under the species); Esquimalt, B. C., *Harvey)* 1862, p. 175, under *Callithamnion arbuscula* var. *Pacificum*); Vancouver Island, B. C., *J. G. Agardh* (1876, p. 37, under *Callithamnion arbuscula*); Brown Island, San Juan County, Wash., *Tilden*, No. 311!, under *Callithamnion arbuscula*; west coast of Whidbey Island, Wash., *N.L.G.*, No. 231!

Plant smaller and more bushy than the type, main and secondary axes less set off from one another, and the branchlets less dense and less closely applied to the branches. The type of this species, as represented in the type locality at the Golden Gate, San Francisco, is shown in No. 390 of Collins, Holden and Setchell, Phycotheca Boreali-Americana, and the f. *laxum* is shown in No. 943 of the same distribution. The differences in habit due to the differences in structure mentioned above bring about a very considerably different aspect in the two sets of plants.

Ptilota Asplenioides (Turner) Agardh.

On other algæ in the upper sublitoral zone. St. Paul Island, Alaska, *Ruprecht* (1851, p. 232), *Farlow, Anderson and Eaton*,

No. 82!, *Townsend*, No. 5784!, *Greeley and Snodgrass*, No. 5801!; Amaknak Island and Unalaska Island, Alaska, *Postels and Ruprecht* (1840, p. 15); Bay of Morozof (Morzhovoi Bay), Alaska, *Townsend*, No. 5775!; Sannak Island, Alaska, *Turner* (1886, p. 85); Unga, Alaska, *A.A.L.*, No. 5046!; Prince William Sound, Alaska, *Turner* (1808, p. 139, pl. 62, under *Fucus Asplenioides*), *Esper* (1804, p. 78, pl. 147, under *Fucus Asplenioides*), *Postels and Ruprecht* (1840, p. 15), *Saunders* (1901, p. 439); Yakutat Bay, Alaska, *Saunders* (1901, p. 439), *Rev. Albin Johnson*, No. 5699!, and in Collins, Holden and Setchell, P. B.-A., No. 999!; Norfolk Sound (near Sitka), Alaska, *Postels and Ruprecht* (1840, p. 15); Puget Sound, *Bailey and Harvey* (1862, p. 163).

A coarse species easily recognized, confined to the northwest coast of North America and the northeast coast of Asia.

Ptilota Californica Harvey.

Cast ashore. Esquimalt, B. C., *Harvey* (1862, p. 175); Port Renfrew, B. C., *Tilden*, No. 307!, under *Ptilota serrata.*

Coarser forms of this may be taken for the preceding, but an examination shows that the pinnules are not at all decurrent. Miss Tilden's specimen is small and imperfect, but seems undoubtedly to belong to this species. Mr. Collins has reported a specimen from Port Renfrew, B. C. (Butler and Polley, No. 90) as being intermediate between this species and *Ptilota Hypnoides* Harvey.

Ptilota filicina J. Agardh.

On rocks in the upper sublitoral zone. St. Paul Island, Alaska, *Greeley and Snodgrass*, No. 5804a!; Unalaska, Alaska, *Postels and Ruprecht* (1840, p. 16, under *Ptilota plumosa*); near Iliuliuk, Unalaska, Alaska, *W.A.S. and A.A.L.*, No. 4099!; Kyska Island, Alaska, *Townsend*, No. 5767!; Sannak Island, Alaska, *Turner* (1886, p. 85, under *Ptilota plumosa* var. *filicina*); Shumagin Islands, Alaska, *Saunders* (1901, p. 16, under *Ptilota plumosa*); Unga, Alaska, *A.A.L.*, Nos. 5045!, 5046a!; Karluk, Kadiak Island, Alaska, *W.A.S.*, No. 5062!; Harvester Island, Uyak Bay, Kadiak Island, Alaska, *W.A.S. and A.A.L.*, No. 5113!; Sitka, Alaska, *Postels and Ruprecht* (1840, p. 16), *Saunders* (1901, p.

439, under *Ptilota plumosa*); Vancouver Island, B. C., *J. G. Agardh* (1876, p. 76); Port Renfrew, B. C., *Butler and Polley*, No. 91; Brown Island, San Juan County, Wash., *Tilden*, No. 306!, under *Ptilota plumosa*; west coast of Whidbey Island, Wash., *N.L.G.*, No. 1!

When typical, this species is not difficult to determine by the fact that the opposite pinnules may differ in size and development, but not otherwise, and are corticated to the very tip. In practice, however, it is, at times, somewhat uncertain as to whether a given specimen belongs to this species or to the next. We have taken it somewhat for granted that the plants from our territory referred to *Ptilota plumosa* really belong to this species, since we have been unable to find any of the former among the specimens we have been able to examine.

Ptilota pectinata (Gunner) Kjellman.

On rocks in the lower litoral and upper sublitoral zones. St. Lawrence Island, Alaska, *Kjellman* (1889, p. 32); St. Paul Island, Alaska, *Townsend*, No. 5783!, *Greeley and Snodgrass*, Nos. 5804b!, 5809!; Agattu Island, Alaska, *Townsend*, No. 5765!; Shumagin Islands, Alaska, *Saunders* (1901, p. 439, under *Ptilota serrata*); San Juan Island, Wash., *N.L.G.*, No. 218!

In this species, which is, at times, very difficult to make certain of, the opposite pinnules are different, one being pinnately branched while the other remains simple and only serrate.

Antithamnion floccosum f. **Pacificum** (Harvey) Setchell and Gardner comb. nov.

Most commonly on the stipes of Nereocystis, sometimes on other algæ and on wood, in the upper sublitoral zone. Yakutat Bay and Lowe Inlet, Alaska, and in Puget Sound, *Saunders* (1901, p. 439, under *Callithamnion floccosum Pacificum*); Esquimalt, B. C., *Harvey* (1862, p. 176, under *Callithamnion floccosum* var. *Pacificum*), *N.L.G.*, No. 325!; Port Renfrew, B. C., *Butler and Polley*, No. 21!; west coast of Whidbey Island, Wash., *N.L.G.*, No. 620!; Orcas Island, Wash., *Harvey* (1862, p. 176, under *Callithamnion floccosum* var. *Pacificum*); Friday Harbor, San Juan Island, Wash., *Tilden*, No. 309!, under *Callithamnion*

floccosum var. *Pacificum*; Pleasant Beach, Kitsap County, Wash., *N.L.G.*, No. 346!

This form, which is abundant on the western coast of North America, grows in dense tufted masses. It is to be recognized by its long, simple, subulate branchlets.

Antithamnion Americanum (Harvey) Kjellman.

On stems of Nereocystis and on wood, in the upper sublitoral zone. Esquimalt, B. C., *Harvey* (1862, p. 175, under *Callithamnion Americanum*); Friday Harbor, San Juan Island, Wash., *N.L.G.*, No. 502!

The specimen from San Juan Island is referred here with some doubt. The tetrasporangia are secund on the branchlets, but they are also provided with a unicellular pedicel.

Antithamnion Pylaisæi (Montagne) Kjellman.

On Nereocystis and on wood, upper sublitoral zone. West coast of Whidbey Island, Wash., *N.L.G.*, Nos. 72!, 447!, 453!; Friday Harbor, San Juan Island, Wash., *N.L.G.*, No. 503!

The specimens referred here have a more verticillate habit than the last, and are more slender than the next. They seem to be distinguished better by habit than by any microscopical character.

Antithamnion Pylaisæi f. Norvegica Kjellman.

Floating. Ludlow Bay, Jefferson County, Wash., *N.L.G.*, No. 438!

Agrees well with Kjellman's figure (1883, pl. 16, f. 1).

Antithamnion subulatum (Harvey) J. Agardh.

On larger algæ. Esquimalt, B. C., *Harvey* (1862, p. 175, under *Callithamnion subulatum*); Port Renfrew, B. C., *Butler and Polley*, No. 40, and in Collins, Holden and Setchell, P. B.-A., No. 944!; Vancouver Island, B. C., *G. W. Lichtenthaler* (in Herb. F. S. Collins); west coast of Whidbey Island, Wash., *N.L.G.*, No. 922!

A coarser species than the preceding and with the pinnules provided with short subulate lateral branches. The type seems to have disappeared, since Professor W. G. Farlow has searched

for it both at Dublin and at London without success. The determination of the P. B.-A. specimen is by Farlow and Collins and may be accepted for the present as representing the species. The specimen distributed by Miss Tilden under the name *Callithamnion subulatum* (No. 310) is an entirely different plant and will be noted under *Platythamnion heteromorphum*. We append a note kindly furnished us by Mr. F. S. Collins.

"It is doubtful if there are any authentic specimens in existence of Harvey's *Callithamnion subulatum*; Prof. Farlow states that he looked for the specimens in Harvey's herbarium at Dublin, but without success; the specimens now in question are referred to this species from the general agreement with the diagnosis given by Harvey (Proc. Linn. Soc., Bot., Vol. VI, p. 175). While Harvey compares the plant with *C. Americanum* Harv., it seems to be nearer to *Antithamnion Pylaisæi* (Mont.) Kjellman. *A. Americanum* has long, slender, loose ramuli, *A. Pylaisæi* more dense, short and stout, while *A. subulatum*, as here understood, carries these characters to a still greater degree. The articulations are shorter, seldom over three diameters in the main branches, while in the lesser ramuli the cells are often broader than long. Every ramulus tapers from the base to the very acute tip, while in *A. Pylaisæi* the tapering is manifest only near the end, and the terminal cell is not very acute; in New England specimens not so acute as in Harvey's figure (Nereis Bor.-Am., Pl. XXXVI B). The main branches are less divided in *A. subulatum* than in *A. Americanum* or *A. Pylaisæi*, resembling rather some forms of *A. floccosum*. The tetraspores in the Vancouver specimens are usually cruciate, but sometimes rather irregular, and might at a hasty glance be taken for tripartite, as described by Harvey. While the species is evidently nearly related to *A. Pylaisæi*, *A. floccosum* and *A. Americanum*, it is as distinct from them as they are from each other; and the specimens examined, nearly one hundred in number, are quite uniform."

Antithamnion Plumula (Ellis) J. Agardh.

Saunders (1901, p. 439) says that this species was collected by him several times in Puget Sound, but was not seen in Alaskan

waters. He also says that it is a comparatively common plant in Puget Sound, while on the central Californian coast it is rarely found. We have not seen any specimens referable to the genuine *A. Plumula* from any portion of the western coast of North America.

Antithamnion boreale f. typica Kjellman.

On rocks and wood in the litoral zone. Port Clarence and St. Lawrence Island, Alaska, *Kjellman* (1901, p. 33); Cape Denbigh, Norton Sound, Alaska, *R. C. McGregor*, No. 5661!; Friday Harbor, San Juan Island, Wash., *N.L.G.*, No. 490!

This form runs into the next and it is often difficult to determine to which form a given plant is to be referred.

Antithamnion boreale f. corallina Kjellman.

On rocks in the middle and lower litoral zones. Besboro Island, Norton Sound, Alaska, *R. C. McGregor*, No. 5662!; Cormorant Rocks, Uyak Bay, Kadiak Island, Alaska, *W.A.S. and A.A.L.*, No. 5135!; Sitka and Wrangell, Alaska, *Saunders* (1901, p. 349, under *Antithamnion boreale*).

Saunders's specimens are placed here because he says that they are very close to this form. All the species of Antithamnion seem to be connected by intermediate forms from the simplest forms of *A. boreale* up to the most complex forms of *A. Pylaisæi* or *A. subulatum*. We may well believe with Kjellman (1883, p. 181) that "the genus *Antithamnion* is a young genus whose species are in course of development, no marked differentiation being as yet established and the transitional forms not having disappeared."

Platythamnion heteromorphum f. **typicum** Setchell and Gardner comb. nov.

Cast ashore. West coast of Whidbey Island, Wash., *N.L.G.*, Nos. 164!, 408!; Friday Harbor, San Juan Island, Wash., *Tilden*, No. 310!, under *Callithamnion subulatum*.

The plants referred here seem to agree well with the descriptions of J. G. Agardh (1876, p. 23, and 1892, pp. 22, 23.) The pinnules have branchlets distichous and on both sides below, but secund and on the upper side, above.

Platythamnion heteromorphum f. **reversum** Setchell and Gardner f. nov. Plate 25.

Cast ashore. West coast of Whidbey Island, Wash., *N.L.G.*, Nos. 8!, 621!

This form differs from the last in the branchlets of the upper pinnules being secund and on the lower side, as shown in the figure quoted above. It may be only a casual variation, but it deserves at least a form-name and more study in its native waters.

Ceramium rubrum (Hudson) Agardh.

Bering Sea, Herb. *University of California* (2 specimens without name of collector, but date of 1892); St. Lawrence Island and Port Clarence, Alaska, *Kjellman* (1889, p. 32); Prince William Sound and Sitka, Alaska, *Saunders* (1901, p. 439); Esquimalt, B. C., *Harvey* (1862, p. 175); Vancouver Island, B. C., *J. G. Agardh* (1894, p. 38); Puget Sound, *Bailey and Harvey* (1862, p. 163).

We quote under this name the specimens referred here by others and which we have not been able to examine. We feel certain that a careful study will show that more than one species, in the later sense of J. G. Agardh (1894, under Ceramium), has been included. We do not feel at all certain that the Bering Sea specimens are *C. rubrum* in the narrower sense.

Ceramium rubrum var. Pacificum Collins.

Port Renfrew, B. C., *Butler and Polley*, No. 30; west coast of Whidbey Island, Wash., *N.L.G.*, No. 117!; Tracyton, Kitsap County, Wash., *Tilden*, No. 207!, under *Ceramium diaphanum*.

The plant referred here is common on the western coasts of North America from Puget Sound to Lower California, but the name is merely provisional since it may be referred later under some other of the *C. rubrum*-group. The specimen of Miss Tilden's American Algæ is a fragment, but seems to belong here, certainly not under *Ceramium diaphanum* (Lightfoot) Agardh.

Ceramium cancellatum Agardh.

Esquimalt, B. C., *Harvey* (1862, p. 175).

Unknown to us.

Ceramium codicola J. Agardh.

On *Codium mucronatum* f. *Californicum*. Sitka, Alaska, *Saunders* (1901, p. 439); Ludlow Bay, Jefferson County, Wash., *N.L.G.*, No. 439!

The specimens collected at Ludlow Bay are well developed and have both cystocarps and tetrasporangia.

Ceramium tenuissimum (Lyngbye) J. Agardh.

On sticks and stones in brackish or muddy water, upper sublitoral zone. Esquimalt, B. C., *Harvey* (1862, p. 175); Whidbey Island, Wash., *N.L.G.*, No. 236!

We are indebted to Mr. F. S. Collins for the determination of the plant from Whidbey Island.

Ceramium Californicum J. Agardh.

On algæ in the upper sublitoral zone. Esquimalt and Point Roberts, B. C., *Harvey* (1862, p. 175, under *Ceramium diaphanum*); west coast of Whidbey Island, Wash., *N.L.G.*, Nos. 617!, 617a!, 618!

We have not seen Harvey's plants, but refer them here because the rest of the west coast *C. diaphanum* has been placed under this species. The Whidbey Island specimens are typical and show cystocarps, tetrasporangia, and antheridia.

Microcladia borealis Ruprecht.

On rocks in the litoral zone. Unalaska, Alaska, *Ruprecht* (1851, p. 259); "Pinnacles," Bay of Unalaska, Alaska, *W.A.S. and A.A.L.*, No. 5004!; west shore of Amaknak Island, Bay of Unalaska, Alaska, *W.A.S. and A.A.L.*, No. 3256!; "Una Nootka" and Fort Vancouver, B. C., *Harvey* (1852, p. 210); Strait of Juan de Fuca, B. C., *Harvey* (1862, p. 175); Puget Sound, *Saunders* (1901, p. 449); Port Renfrew, B. C., *Butler and Polley*, No. 18; west coast of Whidbey Island, Wash., *N.L.G.*, No. 172a!; Friday Harbor, San Juan Island, Wash., *N.L.G.*, No. 222!

This species is fairly common on the shores of the Bay of Unalaska, but was not found, nor is it reported, from any of the shores until the region of Puget Sound is reached. It is common along the coast of Oregon and on that of California down to the neighborhood of Point Conception.

Microcladia Californica Farlow.

Port Renfrew, B. C., *Butler and Polley*, No. 35.

The determination is by Mr. F. S. Collins and the specimen is preserved in his herbarium.

Microcladia Coulteri Harvey.

On algæ in the upper sublitoral zone. Esquimalt, B. C., *Harvey* (1862, p. 175); Port Renfrew, B. C., *Butler and Polley*, No. 37; Strait of Juan de Fuca, *G. W. Lichtenthaler;* west coast of Whidbey Island, Wash., *N.L.G.*, Nos. 26!, 37!, 99!

The plants from Whidbey Island have good involucrate cystocarps and consequently belong here. Miss Tilden has distributed a specimen (No. 206!) from Tracyton, Kitsap County, Wash., which probably belongs here, but the specimen is fragmentary and sterile and may belong to the preceding species.

Rhodochorton Rothii (Turton) Naegeli.

On rocks in the litoral zone. St. Michael, Alaska, *W.A.S.*, Nos. 5244x!, 5153x!; Prince William Sound, Alaska, *Saunders* (1901, p. 440); Victoria, B. C., *N.L.G.*, No. 330!; Hog Island, near LaConner, Skagit County, Wash., *N.L.G.*, No. 307!

Some of the specimens bear tetrasporangia, notably No. 5244x.

Rhodochorton subimmersum Setchell and Gardner sp. nov. PLATE 17.

Prostrate filaments immersed in the cortex of the host plant, giving rise to simple erect filaments which project above the surface of the host, and bear the tetrasporangia at the tips. Tetrasporangia one or two at the tip of an erect filament, cruciately divided.

Forming irregular patches in the frond of *Grateloupia Cutleriæ*. West coast of Whidbey Island, Wash., *N.L.G.*, Nos. 289!, 289a!

This minute, somewhat immersed species differs from anything that has been described, unless it be *Callithamnion humile* Kuetzing, figured in the Tabulæ Phycologicæ (Vol. 11 pl. 58, I). A careful comparison with the original will be necessary to determine whether they are the same or not.

Family GLOIOSIPHONIACEÆ.

Gloiopeltis furcata (P. & R.) J. Agardh.

On rocks in the litoral zone. North Pacific Ocean, *Postels and Ruprecht* (1840, p. 19, under *Dumontia furcata*); Shumagin Islands, Alaska, *Saunders* (1901, p. 440); Uyak Bay, Kadiak Island, Alaska, *W.A.S. and A.A.L.*, No. 5089!; Yakutat Bay, Sitka, and Annette Island, Alaska, *Saunders* (1901, p. 440); Port Renfrew, B. C., *Butler and Polley*, No. 28!, and in Collins, Holden and Setchell, P. B.-A., No. 945b!; Brown Island, San Juan County, Wash., *Tilden*, No. 305!; west coast of Whidbey Island, Wash., *N.L.G.*, No. 198!, and in Collins, Holden and Setchell, P. B.-A., No. 945a!; San Juan Island, Wash., *N.L.G.*, No. 198a!

Gloiosiphonia Californica (Farlow) J. Agardh.

On rocks and on wood in the upper sublitoral zone, and even in tide pools in the litoral zone. Prince William Sound, Alaska, *Saunders* (1901, p. 440); Esquimalt, B. C., *W.A.S.*, No. 1869!; Port Angeles, Clallam County, Wash., *G. W. Lichtenthaler*; Pleasant Beach, Kitsap County, Wash., *N.L.G.*, No. 343!

This plant was first described by Farlow under Nemastoma, (1877, p. 243), later referred to Gloiosiphonia by J. G. Agardh (1884, p. 10), and still later to Calosiphonia (1899, p. 83). Probably to be included under this species are *Halymenia ligulata* Harvey (1862, p. 173) and *Gloiosiphonia capillaris* Harvey (1862, p. 174), from Esquimalt, B. C.

Gloiosiphonia verticillaris Farlow.

On stones in the upper sublitoral zone. Port Renfrew, B. C., *Tilden*, No. 205!; near Port Townsend, Wash., *N.L.G.*!; west coast of Whidbey Island, Wash., *N.L.G.*, No. 169!

Apparently a very rare species in the region of Puget Sound. It occurs also on the coast of California, but unless it is detected at the period of growth (spring), it might be searched for in vain.

Family GRATELOUPIACEÆ.

Ædes nitidissima J. Agardh.

Cast ashore, probably growing in the sublitoral zone at a depth of several fathoms. West coast of Whidbey Island, Wash., *N.L.G.*, Nos. 152!, 487!, and in Collins, Holden and Setchell, P. B.-A., No. 946!

The discovery of this New Zealand species on the coast of California has been announced by one of us (cf. Setchell, 1901, p. 126) and now we have the opportunity of recording its occurrence in the region of Puget Sound. The specimens distributed show both cystocarps and tetrasporangia and agree in habit and structure with an authentic specimen distributed by J. G. Agardh. The shiny appearance of the surface of the frond which is responsible for the specific name seems to depend upon age and circumstances of preparation of the specimen, being very pronounced in some specimens and absolutely lacking in others.

Grateloupia Cutleriæ (Binder) J. Agardh.

Cast ashore from the upper sublitoral zone. West coast of Whidbey Island, Wash., *N.L.G.*, Nos. 98!, 135!, 148!, 191!

The specimens from Whidbey Island are all large and more or less pinnate, and agree well with the figures of this species in Kuetzing's Tabulæ Phycologicæ (pl. 35, 36, and 37, especially with the last). Some of the specimens have the "pinnæ" large and again once or twice pinnate. Both cystocarpic and tetrasporic plants have been found. Older forms are to be distinguished from some forms of *Prionitis Lyallii* chiefly by their softer texture.

Grateloupia pinnata (P. & R.) Setchell.

On rocks in the upper litoral zone. Norfolk Sound (near Sitka), Alaska, *Postels and Ruprecht* (1840, p. 18, under *Iridæa pinnata*); Port Renfrew, B. C., *Butler and Polley*, No. 87, and in Collins, Holden and Setchell, P. B.-A., No. 947!; Tracyton, Kitsap County, Wash., *Tilden*, No. 222!, under *Gigartina microphylla*.

The specimens included under this name, other than the type, have been compared with an authentic specimen in Herb. Farlow by F. S. Collins, who reports that they are of the same general habit as the Ruprecht specimens, but that the latter are coarser. We feel that it is reasonably safe to quote them under this species, since there is no doubt but that the *Iridæa pinnata* P. & R. is a Grateloupia, with Norfolk Sound in the region of Sitka, Alaska, for the type locality. Miss Tilden's specimen is young, but seems certainly to belong here and has nothing in common with *Gigartina microphylla* Harvey. The specimens collected at Port Renfrew have both cystocarps and tetrasporangia. This species has nothing to do with *Grateloupia pinnata* (Hooker and Harvey) J. Agardh, which, if retained in this genus, may, if we follow priority, need a new specific name.

Prionitis Lyallii Harvey.

We have had the opportunity of examining the cotypes of several of the forms of this species in Herb. Farlow and of comparing these with considerable material collected on the coasts of Puget Sound and of California. We have come to the conclusion that there exist at least four well marked species on the western coast of North America, viz.: *P. Lyalli* Harvey, *P. lanceolata* Harvey, *P. angusta* (Harvey) Setchell, and *P. decipiens* (Montagne) J. Agardh. These have been distributed as follows:—

P. Lyallii f. *normalis*—Collins, Holden and Setchell, P. B.-A., No. 448!, Farlow, Anderson and Eaton, Alg. Exsicc. Am. Bor., No. 24!; *P. Lyallii* f. *gladiata*—Collins, Holden and Setchell, P. B.-A., No. XXV!; *P. lanceolata*—Farlow, Anderson and Eaton, Alg. Exsicc. Am. Bor., No. 81a!, Collins, Holden and Setchell, P. B.-A., No. 199a!; *P. angusta*—Farlow, Anderson and Eaton, Alg. Exsicc. Am. Bor., No. 81B!, Collins, Holden and Setchell, P. B.-A., No. XXIV!; *P. decipiens*—Collins, Holden and Setchell, P. B.-A., No. 199b!

Prionitis Lyallii is to be distinguished by having its branches and branchlets decidedly contracted at the base and more or less gladiate. It approaches *P. lanceolata* too closely at times. Harvey has separated the various forms under a number of formnames which are given below. They pass into one another by insensible gradations.

Prionitis Lyallii f. lanceolata Harvey.

Esquimalt, B. C., *Harvey* (1862, p. 173).

Prionitis Lyallii f. ornata Harvey.

Esquimalt, B. C., *Harvey* (1862, p. 173); west coast of Whidbey Island, Wash., *N.L.G.*, No. 638!, and in Collins, Holden and Setchell, P. B.-A., No. 949!

The specimen distributed corresponds fairly well to the description of Harvey, except that it is much more branched and of firmer texture. Miss Tilden has distributed a scrap under No. 204 of her American Algæ which may belong here. It came from Port Orchard, Kitsap County, Wash.

Prionitis Lyallii f. normalis Harvey.

Esquimalt, B. C., *Harvey* (1862, p. 173); Penn's Cove, near Coupeville, east coast of Whidbey Island, Wash., *N.L.G.*, No. 65!; near Seattle, Wash., *Tilden*, No. 302!, under *Farlowia compressa*.

We have been able to examine a cotype of this form in Herb. Farlow and can refer the specimens quoted above with confidence.

Prionitis Lyallii f. gladiata Setchell.

Port Renfrew, B. C., *Butler and Polley*, No. 75.

Prionitis Lyallii f. densissima Harvey.

On rocks in tide pools, upper litoral zone. Esquimalt, B. C., *Harvey*! (1862, p. 174), *N.L.G.*, No. 639!, and in Collins, Holden and Setchell, P. B.-A., No. 948!; Port Renfrew, B. C., *Butler and Polley*, No. 119!; Fairhaven, Wash., *N.L.G.*, No. 78!; Whidbey Island, Wash., *N.L.G.*!; San Juan Island, Wash., *Tilden*, No. 303!, under *Prionitis lanceolata*.

These plants agree well with a specimen from Harvey in Herb. Farlow.

Prionitis Lyallii f. intermedia Harvey.

Esquimalt, B. C., *Harvey* (1862, p. 174).

Prionitis Lyallii f. dilatata Harvey.

Esquimalt, B. C., *Harvey* (1862, p. 174).

Prionitis Lyallii f. depauperata Harvey.

Esquimalt, B. C., *Harvey* (1862, p. 174).

Prionitis lanceolata Harvey.

Puget Sound, *Bailey and Harvey* (1862, p. 162).

We have never seen a specimen of undoubted *P. lanceolata* from our territory.

Prionitis lanceolata? var. filicina Harvey.

Esquimalt, B. C., *Harvey* (1862, p. 174).

Prionitis jubata J. Agardh.

Sitka, Alaska, "Ex. Herb. *Acad. Petrop.*" in Herb. Farlow!, under *Gelidium crassifolium*.

Two specimens are preserved in Herb. Farlow, having come from the Herbarium of the St. Petersburg Academy and bearing the name of *Gelidium crassifolium*. This is the name, credited to Postels and Ruprecht, given by J. G. Agardh (1876, p. 160) under his *Prionitis jubata*. The plants seem to belong to a dwarf form of *Prionitis lanceolata*, but not certainly so.

Cryptonemia obovata J. Agardh.

Attached to pebbles in the upper sublitoral zone. Prince William Sound, Alaska and in Puget Sound, *Saunders* (1901, p. 440).

Family DUMONTIACEÆ.

Dumontia filiformis (Lyngbye) J. Agardh.

On stones in the middle litoral zone. Port Clarence, Alaska, *Kjellman* (1889, p. 30); east shore of Amaknak Island, Bay of Unalaska, Alaska, *W.A.S. and A.A.L.*, No. 3277!; west shore of Amaknak Island, Bay of Unalaska, Alaska, *W.A.S. and A.A.L.*, No. 5001!; Shumagin Islands, Kukak Bay, Cook Inlet, and Prince William Sound, Alaska, *Saunders* (1901, p. 440).

From what Kjellman says (1889, p. 30), it seems that there may be reasons for separating the plant of the North Pacific from that of the North Atlantic. We have had little opportunity for examining the plant of the latter region, while the plants of the

North Pacific accessible to us are all tetrasporic. Concerning the synonymy and adoption of the name, we have followed the general usage according to J. G. Agardh (1876, p. 257) even after a careful consideration of the elaborate discussion of Ruprecht (1851, pp. 295–308, under *D. contorta*). Most of the species placed under Dumontia by Postels and Ruprecht are to be referred to Halosaccion or Gloiopeltis, while *D. Clava* and *D. coronata* are, according to Ruprecht (1851, p. 286), of animal rather than of plant nature, although the latter has been referred to as possibly being a *Chætangium*.

Cryptosiphonia Woodii J. Agardh.

On rocks more or less exposed to the waves, in the litoral zone. West shore of Amaknak Island, Bay of Unalaska, Alaska, *W.A.S. and A.A.L.*, No. 3267!; near Iliuliuk, Unalaska, Alaska, *W.A.S and A.A.L.*, Nos. 4039!, 5010!; Sitka, Alaska, *W.A.S. and A.A.L.*, No. 5207!; Vancouver Island, B. C., *J. G. Agardh* (1870, p. 15, under *Pikea Woodii*); west coast of Whidbey Island, Wash., *N.L.G.*, No. 5!

It seems that the more densely branched, bushy species which does not collapse when removed from the water, is *Cryptosiphonia Woodii* and not the slender plant which collapses. The latter has passed among Californian algologists under this name, however, and has been distributed by one of us (in Collins, Holden and Setchell, P. B.-A., No. 449!) under it, but is really to be placed under the next species. It may be doubted whether the two species (as now recognized) represent more than divergent forms of one rather varied species!

Cryptosiphonia Grayana J. Agardh.

On rocks in the litoral zone. Harvester Island, Uyak Bay, Kadiak Island, Alaska, *W.A.S. and A.A.L.*, No. 5126!; Kukak Bay, Alaska, *Saunders* (1901, p. 441); Orca, Alaska, *W.A.S. and A.A.L.*, No. 5160!; Yakutat Bay, Sitka, and Wrangell, Alaska, *Saunders* (1901, p. 441); Vancouver Island, B. C., *J. G. Agardh* (1870, p. 15, under *Pikea Grayana*); west coast of Whidbey Island, Wash., *N.L.G.*, No. 5a!

Farlowia mollis (Harvey and Bailey) Farlow and Setchell.

On rocks in the upper part of the sublitoral zone. Puget Sound, *Harvey and Bailey* (1851, p. 372), *Bailey and Harvey* (1862, p. 163, pl. 6, f. 3, 4), both under *Gigartina mollis*; Strait of Juan de Fuca, *Harvey* (1862, p. 173, under *Gigartina mollis*); Port Renfrew, B. C., *Butler and Polley*, Nos. 86!, 122!; west coast of Whidbey Island, Wash., *N.L.G.*, Nos. 113!, 214!, 239!

As stated under No. 898 of Collins, Holden and Setchell, P. B.-A., the plant named *Gigartina mollis* by Harvey and Bailey is really a Farlowia and closely related to, perhaps identical with, *Farlowia compressa* J. Agardh. It is, however, a smaller, thinner, usually more pinnate plant than the type of that species. Californian specimens have been distributed under the number of the P. B.-A. quoted above.

Sarcophyllis arctica Kjellman.

On rocks in tide pools in the litoral zone and in the upper sublitoral zone. Port Clarence, Alaska, *Kjellman* (1889, p. 28); west shore of Amaknak Island, Bay of Unalaska, Alaska, *W.A.S. and A.A.L.*, Nos. 3243!, 5042!; near Iliuliuk, Unalaska, Alaska, *W.A.S. and A.A.L.*, No. 4072!; Shumagin Islands, Alaska, *Saunders* (1901, p. 441, under *Dilsea arctica*); Unga, Alaska, *A.A.L.*, No. 5053!; Karluk, Kadiak Island, Alaska, *W.A.S.*, No. 5067!; Uyak Bay, Kadiak Island, Alaska, *W.A.S. and A.A.L.*, No. 5079a!

We prefer to retain the generic name Sarcophyllis for this genus, in preference to the name Dilsea, since for some twenty-five or more years it has been used, and the name Dilsea, doubtful and resurrected only recently from oblivion, has no rights from usage.

Sarcophyllis Californica J. Agardh.

On rocks in the upper sublitoral zone. Unga, Alaska, *J. B. Downing*, No. 5786!; Orca, Alaska, *Saunders*, No. 313!, (1901, p. 441, under *Dilsea Californica*); Port Renfrew, B. C., *Butler and Polley*, Nos. 71!, 80!; west coast of Whidbey Island, Wash., *N.L.G.*, Nos. 274!, 283!; San Juan Island, Wash., *Tilden*, No. 323!, under *Turnerella Mertensiana*.

Whether all the plants placed under this name are to be included in one species may perhaps be doubted. Nevertheless, it is our experience with this species on the coast of California, that it varies much in size, color, shape and thickness, according to the season, age, and exposure. The specimen of Miss Tilden is a large fragment with good cystocarpic fruit, which is clearly that of Sarcophyllis.

Sarcophyllis pygmaea Setchell comb. nov. Plate 19.

Port Renfrew, B. C., *Butler and Polley*, No. 46!

The specimens of Misses Butler and Polley agree well with the specimens of this species issued by one of us in Collins, Holden and Setchell, P. B.-A., No. 396, under *Sarcophyllis Californica* f. *pygmæa*, and described later under the name of *Dilsea pygmæa* (cf. Setchell, 1901, p. 126). Very little of the horizontal thallus appears in the specimens, but in every other respect the agreement is perfect.

Constantinea rosa-marina (Gmelin) P. & R.

On stones and shells in the lower litoral and sublitoral zones, most commonly collected when cast ashore. St. Paul Island, Alaska, *Ruprecht* (1851, pp. 232, 262), Herb. *D. C. Eaton*!; near Iliuliuk, Unalaska, Alaska, *W.A.S. and A.A.L.*, Nos. 4082!, 4086!; Unga, Alaska, *A.A.L.*, No. 5049a!; Uyak Bay, Kadiak Island, Alaska, *W.A.S. and A.A.L.*, No. 5092!; Prince William Sound, Alaska, *Saunders*, No. 298! (1901, p. 441).

Various opinions have been held as to whether this plant is to be considered as being distinct from the next or not. From the materials at present accessible to us, we hold that it is to be distinguished from the next by the manner of the origin of the new blades. In this species, as far as we can judge from the figure of Gmelin (1768, pl. 5, f. 2 and 2a) the new blade appears first as a rosulate or saucer-shaped, nearly sessile structure, and this is farther shown in the description and plate of Postels and Ruprecht (1840, p. 17, pl. 30). In the next species, as shown in plate 18, figure 18, the first appearance of the new proliferation is in the form of a subulate structure which grows to some considerable length before the blade proper makes its appearance.

In *Constantinea simplex* Setchell (1901, p. 127), the proliferation is also rosulate (cf. Plate 18, f. 19–21). *C. rosa-marina* is not so ample a plant as the next, but this may not hold when more material is available for comparison.

Constantinea Sitchensis P. & R. Plate 18.

On rocks in the upper sublitoral zone, frequently cast ashore in considerable quantity. Sitka, Alaska, *Postels and Ruprecht* (1840, p. 17); Victoria, B. C., *Harvey* (1862, p. 172); Esquimalt, B. C., *Tilden*, No. 203!; west coast of Whidbey Island, Wash., *N.L.G.*, Nos. 94!, 685!; Mats-Mats Bay, Jefferson County, Wash., *N.L.G.*, in Collins, Holden and Setchell, P. B.-A., No. 950!; San Juan Island, Wash., *N.L.G.*!

We feel very certain of all the plants referred to this species, but feel, also, that we may have referred some of this species to the preceding, particularly the plant from Prince William Sound. E. M. Freeman (1899a) has given a very formal account of the structure of this species (under the name of *Constantinea rosa-marina*) but has neglected to treat of the most important point, viz.: the method of proliferation.

Family Nemastomaceæ.

Schizymenia Dubyi J. Agardh.

Esquimalt, B. C., *Harvey* (1862, p. 174).

We know nothing of this plant, but suspect that we may have included it under *Sarcophyllis Californica*.

Schizymenia coccinea Harvey.

In 14 fathoms. Griffin Bay, San Juan Island, Wash., *Harvey* (1862, p. 174).

We have been able to examine a small fragment of the type preserved in Herb. Farlow, and while we cannot be certain, we think that it is the same as the plant we have placed under *Æodes nitidissima*.

FAMILY SQUAMARIACEÆ.

Petrocelis Middendorfii (Ruprecht) Kjellman.

Forming a close covering on rocks in the upper litoral zone. Harvester Island, Uyak Bay, Kadiak Island, Alaska, *W.A.S. and A.A.L.*, No. 5124!; west coast of Whidbey Island, Wash., *N.L.G.*, Nos. 74!, 262!, 488! = *Ralfsia*

Our plants are all sterile, but have the pronounced basal portion, branching, etc., characteristic of this species.

Cruoria Pacifica Kjellman.

On stones and mussel shells, in the upper sublitoral zone. Port Clarence, Alaska, *Kjellman* (1889, p. 26).

FAMILY CORALLINACEÆ.

The crustaceous forms have all been submitted to M. Foslie, of Trondheim, Norway, who has determined them and examined and approved the following account of the species (under the first four genera).

Clathromorphum circumscriptum (Strœmfelt) Foslie.

On stones in tide pools in the litoral and sublitoral zones. Port Clarence, Alaska, *Kjellman*, (1889, p. 22, under *Lithothamnion durum*); near Iliuliuk, Unalaska, Alaska, *W.A.S. and A.A.L.*, Nos. 4022!, 4081a!; Kukak Bay and Sitka, Alaska, *Saunders* (1901, p. 442).

Clathromorphum compactum (Kjellman) Foslie.

On mussel shells, lower litoral zone. St. Michael, Alaska, *W.A.S.*, No. 5156y!; Prince William Sound, Alaska, *Saunders* (1901, p. 422, under *Lithothamnion compactum*).

Clathromorphum loculosum (Kjellman) Foslie.

St. Lawrence Island, Alaska, *Kjellman* (1889, p. 21, under *Lithothamnion loculosum*).

Lithothamnion glaciale Kjellman.

In the upper elitoral and lower sublitoral zones. Shumagin Islands, Kukak Bay, and Prince William Sound, Alaska, *Saunders* (1901, p. 442).

Lithothamnion glaciale f. —— Foslie.

West coast of Whidbey Island, Wash., *N.L.G.*, No. 134!

Lithothamnion Sonderi f. Pacifica Foslie.

On rocks, upper sublitoral zone. Channel Rocks, near Seattle, Wash., *N.L.G.*, No. 654!

Lithothamnion phymatodeum Foslie.

West coast of Whidbey Island, Wash., *N.L.G.*, No. 653!

Lithothamnion læve (Strœmfelt) Foslie.

On rocks in the sublitoral zone. Kukak Bay, Alaska, *Saunders* (1901, p. 442).

Lithothamnion læve f. tenue (Kjellman) Foslie.

On mussel shells in the upper sublitoral zone. Port Clarence, Alaska, Kjellman (1889, p. 22, under *Lithophyllum tenue*).

Lithothamnion Californicum Foslie.

Upper sublitoral zone. Port Renfrew, B. C., *Yendo*; Channel Rocks, near Seattle, Wash., *N.L.G.*, No. 654! (in part).

Lithothamnion conchatum Setchell and Foslie.

On Amphiroa. Port Renfrew, B. C., *Yendo* (Foslie, 1902, p. 6); west coast of Whidbey Island, Wash., *N.L.G.*, No. 83a!

Probably "*Melobesia patens*" of Saunders (1901, p. 441) from Prince William Sound, on Amphiroa, belongs here.

Lithophyllum tumidulum Foslie.

On *Ahnfeldtia concinna*. West coast of Whidbey Island, Wash., *N.L.G.*, No. 658!

Lithophyllum (Eulithophyllum) incrustans f. orbicularis Foslie.

Port Renfrew, B.C., *Yendo*.

Lithophyllum (Lepidomorphum) Farlowii Foslie.

Sitka, Alaska, *Saunders* (1901, p. 442).

Lithophyllum Farlowii f.? Foslie.

On limpet shells. West coast of Whidbey Island, Wash., *N.L.G.*, No. 657!

Lithophyllum sp. nov. Foslie.

On limpet shells. West coast of Whidbey Island, Wash., *N.L.G.*, Nos. 655!, 656!

Lithophyllum (Lepidomorphum) Yendoi Foslie.

On rocks in the sublitoral zone. Sitka, Alaska, *Saunders* (1901, p. 442).

Foslie remarks (1901, p. 13) that it is a question whether *L. Yendoi* and *L. decipiens* must not be considered as forms of one and the same species.

Melobesia Zostericolum f. mediocris Foslie.

On Phyllospadix. Port Renfrew, B. C., *Yendo*; west coast of Whidbey Island, Wash., *N.L.G.*, No. 271!

Melobesia (Heteroderma) marginata Setchell and Foslie.

On *Laurencia pinnatifida*, *N.L.G.*, No. 270! and on *Odonthalia semicostata*, *N.L.G.*, No. 269!, both on the west coast of Whidbey Island, Wash.

Amphiroa Aspergillum f. **nana** Setchell and Gardner f. nov.

In loose and small tufts, among other algæ on the rocks. Fronds short, 2–3 cm. high, with branches and branchlets pinnately arranged as in the type. This form differs from the typical form only in its dwarf condition.

Upper sublitoral zone. East Sound, Orcas Island, Wash., *N.L.G.*, No. 482! The only occurrence of this species as yet in our territory is this dwarf form from Orcas Island. The typical form is found in abundance on the coast of California, and has been distributed in Collins, Holden and Setchell, P. B.-A., No. 498, under *Amphiroa nodulosa*. Type loc. Vancouver I

Amphiroa cretacea (P. & R.) Areschoug.

Attached to rocks or even to the spines of sea urchins, in tide pools in the litoral zone and descending to a depth of 10 fathoms or more in the sublitoral zone. St. Lawrence Island

and Port Clarence, Alaska, *Kjellman* (1889, p. 21); St. Paul Island, Alaska, *Setchell* (1899, p. 595); west shore of Amaknak Island, Bay of Unalaska, Alaska, *W.A.S. and A.A.L.*, No. 3242!; Unalaska, Alaska, *Postels and Ruprecht* (1840, p. 20, under *Corallina cretacea*); near Iliuliuk, Unalaska, Alaska, *W.A.S. and A.A.L.*, Nos. 4093!, 4075!; Uyak Bay, Kadiak Island, Alaska, *W.A.S. and A.A.L.*, No. 5088!; Port Renfrew, B. C., *Yendo* (1902, p. 714).

This species is to be distinguished from the forms of the next by the fact that its joints are always cylindrical and never flattened in any portion of the frond. We have not attempted to distinguish between the forms, but we agree with Yendo that *Amphiroa Tasmanica* Kuetzing is probably but a form of this species and that it, or a similar form, occurs in our territory. Of the plants accessible to us and enumerated above, Nos. 3242 and 4075 are the typical form; No. 4093, which is from water of 10 fathoms in depth, agrees with the f. *Tasmanica* Yendo; while No. 5088 shows specimens of both forms growing intermixed.

Amphiroa tuberculosa (P. & R.) Endlicher (in extended sense).

After a long study of the forms of Amphiroa with flattened joints from the western coast of North America, we have come to the conclusion that they are all forms of one polymorphous species, the forms owing their very considerable differences to variations in the environmental conditions under which they may be found growing. It is our experience that all of the jointed Corallinaceæ are very susceptible to such conditions as greater or less depth of submergence, varying light, temperature, impurity or purity of water, especially the admixture, continuous or otherwise, of fresh water, exposure to air and sun when emergent, etc. The grinding of sand in the currents flowing over them or the mutilations by animals, produce variations in habit and the form of the individual joints, sufficient to disturb the typical aspect of the species. We have preferred to use the oldest specific name for the group of forms, although it is, perhaps, the least descriptive. We do not understand the reasons for referring some of the forms to the genus *Cheilosporum*, as

Yendo has done, since that genus, if separable at all from Amphiroa, applies only to a very limited number of species, none of which occur in our territory.

Amphiroa tuberculosa f. **typica** Setchell and Gardner comb. nov.

On rocks in tide pools in the litoral and upper sublitoral zones. Sitka, Alaska, *Postels and Ruprecht* (1840, p. 20), *Saunders* (1901, p. 442); Port Renfrew, B. C., *Yendo* (1902, p. 714), *Butler and Polley*, No. 11!; west coast of Whidbey Island, Wash., *N.L.G.*, No. 83!; San Juan Island, Wash., *Tilden*, No. 301!, under *Amphiroa Californica*.

What we feel should be included under f. *typica* is well described by Yendo under *Amphiroa tuberculosa*. It is a plant which seldom, if ever, is emergent at low water and usually occurs in water of considerable depth. In plants of such habitat we usually find the joints thicker and less obcordate, though flattened, but they also frequently have branches which are cylindrical and which resemble those of *Amphiroa cretacea*. Yendo makes much of the branching of this species as being subdichotomous, but in reality the branching is pinnate, only much less so than in some of the forms of this species. The difference is not in kind, but in regularity and degree, and, consequently, not a character to separate this form and the next from the rest of the forms and give them specific rank.

Amphiroa tuberculosa f. **Californica** (Decaisne) Setchell and Gardner comb. nov.

On rocks in the upper sublitoral and in deep tide pools in the litoral zones. Puget Sound, *Bailey and Harvey* (1862, p. 162, under *Amphiroa Californica*); Strait of Juan de Fuca, *Harvey* (1862, p. 169, under *Amphiroa Californica*); Port Renfrew, B. C., *Yendo* (1902, p. 715, under *Cheilosporum Californicum*).

We have not seen the type of the species of Decaisne, but if the specimen distributed by Farlow and illustrated by Yendo, represents this species, then we feel certain that it is but a form of the polymorphous species, *A. tuberculosa*. It should be somewhat extended beyond Yendo's idea, however, and made to include all the plants which have thick, irregularly triangular joints, with

small or no projecting upper angles, yet usually more pronounced than in the preceding form. In the least development, it is the plant described and figured by Yendo, but while this may have the appearance of being di- to trichotomous, the more highly developed plant is more or less regularly pinnate and even bipinnate. It passes insensibly into the last and into the forms which are usually included under *Amphiroa Orbigniana*, which, in a less than usually slight condition of development, is represented by Harvey in the Nereis Australis (Plate 38) and commonly found on the coast of California.

Amphiroa tuberculosa f. **Orbigniana** (Decaisne) Setchell and Gardner comb. nov.

Although we have not seen a specimen of this form from our territory, it seems best to include a brief discussion of it, because of its relations, as indicated above, to the other forms. In its typical condition it is a long plant, equal in this respect to any plants we have seen of either of the two preceding forms. Its joints are thinner and more distinctly auriculate than those of the preceding form, with pinnate branching well marked. It passes into the preceding as the joints become thicker and shorter, with the auricles reduced or lacking. It also passes into a form with lax and apparently subdichotomous branching, and this is represented by the *Amphiroa Orbigniana* of No. 398 of Collins, Holden and Setchell, P. B.-A. (in our copy), which is characteristic of warmer waters. In the upper and more exposed portions of its habitat, it becomes dwarfed, the branching is more regular and pronouncedly pinnate, and it passes over into the next two forms. States of this form will probably be found at some time in the warmer waters of the Puget Sound region.

Amphiroa tuberculosa f. **frondescens** (P. & R.) Setchell and Gardner comb. nov.

On rocks in the litoral zone. West shore of Amaknak Island, Bay of Unalaska, Alaska, *W.A.S. and A.A.L.*, No. 4004!; Unalaska, Alaska, *Postels and Ruprecht* (1840, p. 20, under *Corallina frondescens*); Harvester Island, Uyak Bay, Kadiak Island, Alaska, *W.A.S. and A.A.L.*, No. 5129a!; Port Renfrew,

B. C., *Yendo* (1902, pp. 715, 716, under *Cheilosporum frondescens* ff.); East Sound, Orcas Island, Wash., *N.L.G.*, No. 916!; west coast of Whidbey Island, Wash., *N.L.G.*, Nos. 80!, 82!

While in some cases, the present form is fairly distinct from the next, in many cases, it is difficult to decide to which form to refer a given specimen. Yendo has recognized this when he says (1902, p. 717):—"Nevertheless, it would not be an unreasonable supposition that the hybrid between *Cheil. frondescens* and *Cheil. planiusculum* may occur in nature." He also recognizes the variability of the plants placed under each by the number of forms which he describes or refers to. The stipe, upon whose length and thickness he depends for one essential difference between the two, varies much and at times seems interchanged. We regard this as a very unreliable character. The apical joints and the thickness or thinness of their external margins do not always lead us safely, and the approximation or non-approximation of the joints seems as little satisfactory. We have retained the two forms and are able to separate them to a certain degree, but not satisfactorily.

Amphiroa tuberculosa f. **planiuscula** (Kuetzing) Setchell and Gardner comb. nov.

On rocks in the lower litoral zone, also in shallow pools in the upper litoral zone. Near Iliuliuk, Unalaska, Alaska, *W.A.S. and A.A.L.*, No. 4057!; Uyak Bay, Kadiak Island, Alaska, *W.A.S. and A.A.L.*, No. 5096!; Harvester Island, Uyak Bay, Kadiak Island, Alaska, *W.A.S. and A.A.L.*, No. 5128!; Prince William Sound and Sitka, Alaska, *Saunders* (1901, p. 442, under *Amphiroa planiuscula*); Port Renfrew, B. C., *Yendo* (1902, p. 717, under *Cheilosporum planiusculum*), *Tilden*, No. 503!, under *Cheilosporum planiusculum;* west coast of Whidbey Island, Wash., *N.L.G.*, Nos. 81!, 918!

We have commented on the relationships of this form and on the difficulty of distinguishing it, under the preceding form. Yendo says (1902, p. 717) that it is difficult to give a sharp definition. In its most characteristic form, it is a thinner species with sharper auricles to the joints in the type of the form, slender stipe, etc., but all these vary and pass directly into the preceding

form. Such characters as these vary so much in our Amphiroas, that they are hardly good ones to establish form-characters upon, much less specific.

The *Amphiroa corymbosa* of Harvey's List (1862, p. 169), represented only by fragments in the collection he received, judging from his idea of that species as represented in the Nereis Australis (pl. 38) may also belong to this form. As to the variations of this form as represented by Kuetzing (1858, p. 31, pl. 63) they are all represented in our collections and may be classed as subforms. The subf. **laciniata** is especially well shown in specimens under our No. 4057. The subf. **antennifera** occurs more or less generally, but usually not in any considerable quantity. The subforms **normalis** and **polyphora** are not well set off from one another, but are both represented in Tilden's No. 503 in our copy of the American Algæ.

Amphiroa epiphlegnoides J. Agardh.

On rocks and other algæ. Prince William Sound and Sitka, Alaska, *Saunders* (1901, p. 442); Strait of Juan de Fuca, *Harvey* (1862, p. 169).

We do not know this species. Yendo thinks (1902, p. 715) that it is quite similar to *Amphiroa tuberculosa*, and places it provisionally under that species (our f. *typica*) as a synonym.

Corallina officinalis L.

Puget Sound, *Bailey and Harvey* (1862, p. 162); Esquimalt, B. C., *Harvey* (1862, p. 169).

After a careful and extensive consideration of the puzzling forms of Corallina of the western coast of North America, we have decided that the best arrangement, for the present, at least, is to place all the plants which have ecorniculate cystocarps under this species as forms. We have not seen the plants quoted above, and consequently place them under the species without comment.

Corallina officinalis f. **typica** Setchell and Gardner comb. nov.

The plant, seemingly to be considered as the type of the species, is to be distinguished by its more or less regularly bipin-

nate branching and the more or less slender tapering branchlets. We have not seen a specimen of this from our territory.

Corallina officinalis f. Chilensis (Decaisne) Kuetzing.

On rocks in the upper sublitoral and in deep pools in the litoral zone. Port Renfrew, B. C., *Yendo* (1902, p. 718).

We have seen no specimens of the type of this form, as represented by Kuetzing (1858, pl. 66 f. I) from our territory, but it is not uncommon in various localities on the coast of California. The very simple condition represented by Kuetzing and by Yendo (1902, pl. 54, f. 1) is not so abundant as conditions with the branches and branchlets more numerous and passing into states characteristic of the second and third forms below. It seems to us that it is to be distinguished from the preceding by its less slender and less tapering branchlets.

Corallina officinalis f. **robusta** Setchell and Gardner f. nov.

The type of the present form is a plant of the Californian coast which has been distributed under 499 of Collins, Holden and Setchell's Phycotheca Boreali-Americana. It differs from the forms just mentioned in being larger and stouter, the joints being more inclined toward a triangular outline in the main axes, while the pinnules and ultimate branchlets are more or less flattened. The cystocarps and conceptacles are terminal on longer or shorter branchlets, but at times the fertile branchlet is so short that it seems sessile on the joint, or upon a projection from it.

In the upper sublitoral zone and in tide pools in the litoral zone. West coast of Whidbey Island, Wash., *N.L.G.*, No. 278!

As it occurs on the Californian coast, this form presents a series of gradations to f. *Chilensis*, but, as it becomes condensed, its aspect is sufficiently changed to give it the appearance of a very distinct plant. We suspect from the figures and descriptions of Yendo that it includes his *Cheilosporum MacMillani* (Yendo, 1902, p. 718, pl. 53, f. 4, 5, pl. 56, f. 11–14) from Port Renfrew, B. C. That agrees very well with the specimens from Whidbey Island, except that in these we have not found any cystocarps on the faces of the joints. We have seen such structures on the faces of the joints of certain Californian forms of

Corallina, but they seem to belong to a species of Choreonema. The *Cheilosporum maximum* Yendo (1902a, p. 22, pl. 2, f. 18, 19, pl. 6, f. 9) seems but a more strongly calcified state of this form, such as we have collected at Monterey, California.

Corallina officinalis f. **pilulifera** (P. & R.) Setchell and Gardner comb. nov.

On rocks in the sublitoral zone. St. Paul Island, Alaska, *Greeley and Snodgrass*, No. 5805a!; Unalaska, Alaska, *Postels and Ruprecht* (1840, p. 20, under *Corallina pilulifera*); east shore of Amaknak Island, Bay of Unalaska, Alaska, *W.A.S. and A.A.L.*, No. 4078!; Shumagin Islands, Alaska, *Saunders* (1901, p. 442, under *Corallina arbuscula*); Prince William Sound, Alaska, *Saunders* (1901, p. 442, under *Corallina pilulifera filiformis*).

A dwarf form including the *Corallina arbuscula* and *C. pilulifera* of Postels and Ruprecht. It forms a transition from f. *Chilensis* to the next, because in some cases there may be found more than two branchlets springing from one joint. The cristate joints prolonged into filiform prolongations are more or less common on the plants examined. The *Corallina pilulifera* of Kuetzing (1858, pl. 64, I) may prove to be a different species. The *Arthrocardia frondescens* of Setchell (1899, p. 595) was based on a few fragments of the *f. filiformis* of Ruprecht and was recognized later when more perfect material was discoverd among the Greeley and Snodgrass collections.

Corallina officinalis f. **multiramosa** Setchell and Gardner nom. nov.

In the lowermost portion of the litoral zone and on the edges of tide pools farther up, growing on rocks. Uyak Bay, Kadiak Island, Alaska, *W.A.S. and A.A.L.*, No. 5129!; Esquimalt, B. C., *N.L.G.*, No. 919!; Port Renfrew, B. C., *Yendo* (1902, p. 719, under *Corallina Vancouveriensis*); west coast of Whidbey Island, Wash., *N.L.G.*, No. 79!

This form is distinguished, as Yendo has pointed out (1902, p. 712, under *Corallina Vancouveriensis*), by having more than two branchlets springing from an articulus the rule, thus giving the plants a distinct habit. This happens to some extent in the

other forms, so that it cannot be considered to be a specific character. The form as we understand it is synonymous with the *Corallina Vancouveriensis* of Yendo, and like that, may be divided into two subforms, as follows: subf. **laxa,** equalling *C. Vancouveriensis* f. *typica* Yendo, and subf. **densa** equalling *C. Vancouveriensis* f. *densa* Yendo.

Corallina officinalis f. **aculeata** (Yendo) Setchell and Gardner comb. nov.

In tide pools, uppermost litoral zone. Port Renfrew, B. C., *Yendo* (1902, p. 720, under *Corallina aculeata*); East Sound, Orcas Island, Wash., *N.L.G.*, No. 917!

Corallina aculeata Yendo is simply the distorted state of the preceding form and the prickly, confusedly ramulose, and flattened or angled branchlets, imperfectly, or in some cases, unusually much calcified, are all due to unfavorable conditions of environment.

Corallina gracilis Lamouroux.

Mr. F. S. Collins has determined with some doubt, a specimen collected by Misses Butler and Polley at Port Renfrew, B. C., as belonging to this species.

Hildenbrandtia prototypus Nardo.

On rocks in the middle litoral zone. Harvester Island, Uyak Bay, Kadiak Island, Alaska, *W.A.S. and A.A.L.*, No. 5109!; west coast of Whidbey Island, Wash., *N.L.G.*, No. 406!; Tracyton, Kitsap County, Wash., *Tilden*, No. 201!, under *Peysonnellia Dubyi*.

The plants placed under this species are dark blood red and represent what has been called *H. sanguinea*. They are darker and thicker than the next.

Hildenbrandtia prototypus f. rosea Hauck.

On stones in the lower litoral and upper sublitoral zones. Port Clarence, Alaska, *Kjellman* (1889, p. 26, under *Hildenbrandtia rosea*); Shumagin Islands to Puget Sound, *Saunders* (1901, p. 441, under *Hildenbrandtia rosea*); west coast of Whidbey Island, Wash., *N.L.G.*, No. 128!

A much thinner species than the last, of a rose red color, and may represent a distinct species.

LIST OF GEOGRAPHICAL NAMES.

We have given the localities for the different species with as much fulness as possible, in order that the distribution may be made as plain as may be done at present. Since there are many names more or less unusual and some which may not readily be found upon the ordinary maps and charts, we have prepared a list of all the names used, with the geographical positions definitely stated. These notes, and the determinations of the latitudes and longitudes, have been generously provided by Professor George Davidson of the University of California.

Alaska.

Agattu Island. The southernmost of the two most western islands of the Aleutian chain. The west point is in Lat. 52°55′ N. and Long. 173°10′ E.

Amaknak Island. This is the long, high island, lying broad in the middle of the Bay of Unalaska, and giving the protection to Captains Harbor (Captains Bay), to Dutch Harbor, and to Iliuliuk. The northernmost part is named Cape Ulakhta, whose position is Lat. 53°56′ N. and Long. 166°28½′ W.

Annette Island. This large island lies in the southern part of the Archipelago Alexander, between the channel Revilla Gigedo on the east and Clarence Strait on the west. The position of the village of Metlakatla is Lat. 55°07′ N. and Long. 131°35′ W.

Bay of Morozof. A large bay on the SE. shore of the Peninsula of Alaska. Position of the western point of entrance, Lat. 54°54′ N. and Long. 162°54′ W. The spelling of the latest charts of the U. S. C. and G. Survey reads Morzhovoi Bay. Other spellings are Marshovo Bay, Morzovia Bay, Bay Morozova, and Morsheovi Bay. Another name is Walrus Bay.

Bay of Unalaska. A very extensive bay on the NE. part of Unalaska Island, broad open to the Bering Sea. The two outer heads are Cape Kalekhta (on the east) and Cape Cheerful (on the west), eight miles apart. It stretches into the mountainous part of the island, 12 n. miles in a general SSW. direction. Inside are several minor bays or anchorages, viz.: Captains Harbor or Bay in the extreme SW., Iliuliuk Harbor, Dutch Harbor, Summer Harbor or Bay, and Constantine Anchorage. The position of Cape Kalekhta is Lat. 53°59½′ N. and Long. 166°20′ W.

Berg Bay. A small fiord on the west shore of Glacier Bay of Icy Strait, 12 n. miles inside Points Carolus and Gustavus. The position of a small islet in the entrance is Lat. 58°28′ N. and Long. 136°07′ W.

ALASKA—(*continued.*)

Besboro Island. A small islet, about 4 miles N.& S., in the easternmost part of Norton Sound and within 12 miles of the eastern shore. It is 45 n.miles NE. from St. Michael and 15 n. miles nearly directly south from Cape Denbigh. Its position is Lat. 64°08′ N. and Long. 161°20′ W.

Cape Denbigh. This is the SE. point of entrance to Norton Bay which, in turn, is the extreme NE. part of Norton Sound. Its position is Lat. 64°16′ N. and Long. 161°43′ W.

Cape Dyer. There are five capes at the northwestern part of the great delta of the Yukon River, the northern most of which is Cape Dyer. Its position is Lat. 61°51′ N. and Long. 166°06′ W.

Cape Nome. This is the long, low, rounding cape, between Cape Rodney (on the west) and Cape Darby (on the east), called the Middle Cape by the Russians. Its position is Lat. 64°25′ N. and Long. 165°05′ W.

Cormorant Rocks. A small cluster of rocks, exposed at low tide in Uyak Bay, one-half mile SSE. from the Uyak Anchorage under Harvester Island. Their position is Lat. 57°37′ N. and Long. 153°58½′ W.

Captains Bay. This is more properly Captains Harbor, the head of the broad and extensive Bay of Unalaska. The NW. point of entrance lies in Lat. 53°53′ N. and Long. 166°32′ W.

Cook Inlet. This is that great arm of the Pacific waters reaching a higher latitude than any other east of the Peninsula of Alaska. It lies between the mainland volcanic range of Redoubt and Iliamna on the west and the Kenai Peninsula on the east. Its entrance is between Cape Elizabeth on the east and Cape Douglas on the west, where it is 46 n. miles wide. Its general direction is NE., and in approaching the head it swings to the east with a mouth 15 miles wide. The position of Cape Elizabeth is Lat. 59°06′ N. and Long. 151°48′ W.

Delarof Harbor. A moderately deep harbor on the SE. arm of Unga Island. The position of the entrance is Lat. 55°10′ N. and Long. 160°25′ W.

Douglas. A small village on Douglas Island, on the south side of Gastineau Channel, opposite Juneau.

Dutch Harbor. In the deep Bay of Unalaska, there is on the NW. side of the Bay or Harbor of Iliuliuk, a long gravel and boulder ridge that forms a good Harbor. It has been called also Lincoln Harbor, from the U.S. Revenue Cutter Lincoln (in 1867), later Ulakhta Harbor (U.S.C. & G. Survey, 1869), and finally Dutch Harbor. The position of the end of the gravel spit is Lat. 53°53′57″ N. and Long. 166°-28′35″ W.

Glacier Bay. An extensive fiord, stretching from the north shore of Icy Strait of the Russians and Cross Sound of the English, for 40 n. miles to the NW. and receiving the waters from the Muir and 6 other glaciers. The entrance is 3½ miles wide, between Point Gustavus on

Alaska—(*continued.*)

the east and Point Carolus on the west. The position of Point Gustavus is Lat. 58°24′ N. and Long. 135°54′ W.

Golofnin Bay. This bay enters Norton Sound just west of the western point, Cape Darby, of Norton Bay. The entrance is broad and open to the south and connects by a narrow shoal channel with a large and shallow inner bay. The whole length towards the NW. is 40 n. miles. The entrance is 6 or 7 miles wide. The position of Cape Darby is Lat. 64°16′ N. and Long. 162°43′ W.

Glacier Valley. This is known as Makúshin Valley on the U.S.C. & G. Survey chart and report of 1867. It opens upon the extreme western and middle part of Unalaska Bay, 4½ n. miles west of Ulakhta Head. It receives the waters from the Makúshin Glacier, described by Davidson in Appalachia, vol. 4, pp. 1–11. The position of the mouth of the valley is Lat. 53°55½′ N. and Long. 166°36′ W.

Harvester Island. Five miles inside the entrance of Uyak Bay on the NW. shore of Kadiak Island are two small islets; the smaller is Bear Island, the larger, reaching an elevation of 840 feet, is Harvester Island. The position of the SW. point of Harvester Island is Lat. 57°38′ N. and Long. 153°58½′ W.

Hidden Glacier. About 15 n. miles from the entrance to Disenchantment Bay, the great fiord that enters the head of Yakutat Bay, the shore retreats to the east to a narrow valley, and about 1½ miles up this valley is the foot of the Hidden Glacier which comes from a great icefield lying to the SE. among the high mountains. The position of the mouth of the valley is Lat. 57°47½′ N. and Long. 139°15½′ W.

Huntville. A location on the beach of Captains Harbor, about a mile south of the point upon which the village of Iliuliuk, Unalaska, is situated. The position is Lat. 53°52′ N. and Long. 166°30′ W.

Iliuliuk. The name of a village on the Bay of Iliuliuk, one of the arms of the Bay of Unalaska, on the NE. of the Island of Unalaska. Its position is Lat. 53°52½′ N. and Long. 166°29′ W. The name of the village is also spelled Illiouliouk.

Juneau. On the mainland on the north side of Gastineau Channel with Douglas on the south side. The NW. end of the channel leads to the Lynn Canal, the SE. end to the Stephens passage near the Taku Inlet. The position is Lat. 58°18′ N. and Long. 134°23′ W.

Kadiak Island. This may be better called Kadiak Archipelago or Group, since there are several islands. They are 160 n. miles long, NW. and SW., and 45 n. miles wide and lie off the SE. face of the Peninsula of Alaska, separated by the Shelikof Strait, 21 n. miles wide. The Lat. of the town of St. Paul, often called Kadiak or Kodiak, is 57°48′ N. and the Long. is 152°21′ W.

Karluk. On the SW. coast of Kadiak Island, at the narrowest part of the Shelikof Strait. It is a salmon-canning establishment at the mouth of

Alaska—(*continued.*)

the Karluk River, which leads to a large lake in the interior. Vast numbers of salmon enter the river for spawning. The position of the station is Lat. 57°36′ N. and Long. 154°26′ W.

Kotzebue Sound. In the Arctic Ocean, just north of Bering Strait, the approaches lying between Cape Prince of Wales and Point Hope. The contracted part lies far to the east of a line joining these two points. The north point of the inner bay is Cape Kruzenstern and the southern point is Cape Espenberg, the distance between them N. and S. being 33 miles. The position of Cape Kruzenstern is Lat. 67°07′ N. and Long. 163°36′ W.

Kukak Bay. In the Shelikof Strait, on the SE. coast of the Peninsula of Alaska and about 42 n. miles SW. from Cape Douglas and 30 miles WNW. from the strait between Afognak and Kadiak Islands. The position of a native village on the north side of the entrance is Lat. 58°21′ N. and Long. 154°05′ W.

Kyska Island. One of the westernmost of the Aleutian chain. There are really two islands, the Great Kyska, 28 n. miles long NW. and SE., only 6 n. miles wide and very crooked, with bold rocky shores and only one fair bay. This bay or Kyska Harbor is on the east side, and broad off to the east is the island of Little Kyska. The position of the harbor is Lat. 52°00′ N. and Long. 177°30′ E. Captain H. E. Nichols, U.S.A., told Professor Davidson that there was much drift wood on this island, but did not mention the exact locality.

Lowe Inlet. This is mentioned in the text as being in Alaska, but as may be seen below, Professor Davidson has informed us that it is in British Columbia.

Muir Glacier. Twenty-five n. miles from the entrance to Glacier Bay. The position of the front of the glacier is Lat. 58°49′ N. and Long. 136°15′ W.

Muir Inlet. This is merely the narrowing of the north and short arm of Glacier Bay, at the Muir Glacier.

Metlakatla. The settlement on Annette Island, already described. Its position is Lat. 55°07′ N. and Long. 131°35′ W.

Norfolk Sound. The Norfolk Sound of Dixon (1787) and adopted by Vancouver (1794), is the Sitka Sound of the Russians and now known as such. It is open to the the west with Cape Edgecumbe on the north and Biorka Inlet on the south, 13 n. miles apart. There are many low, rocky islands in the eastern part, and behind them lies Sitka, the capital of Alaska.

Norton Sound. This is the broad northeastern arm of the Bering Sea, lying north of the delta of the Yukon River and on the south side of the Seward Peninsula. The western line of boundary may be considered to be the 166° meridian of West Longitude, where the width across is 80 n. miles. The depth of water throughout is less than 15

Alaska—(*continued.*)

fathoms, and it is frozen over and full of ice from October to May or June. The middle point of the western boundary (Long. 166° W.) is Lat. 63°25′ N.

Ocean Cape. The low SE. entrance to Yakutat Bay. Its position is Lat. 59°33′ N. and Long. 139°48′ W.

Orca. A salmon cannery in the easternmost portion of Prince William Sound, with shoal water communication with the Pacific Ocean. Its waters are cold from glacial ice in the Sound and streams from the Snow Mountains to the east. Its position is Lat. 60°36′ N. and Long. 145°40′ W.

Pinnacles or Pinnacle Rocks. There are several Pinnacle or Priest Rocks in the neighborhood of Unalaska Bay. Those referred to in the text are on the SW. point of Summer Bay. Their position is Lat. 53°54′ N. and Long. 166°27′ W.

Point Barrow. On the Arctic Coast of Alaska, 210 geographical miles from Bering Strait, following the coast line from point to point. Its position is Lat. 71°22′ N. and Long. 156°12′ W.

Popof Island. The high and rocky island lying east of the NE. point of Unga Island, one of the Shumagin group, the strait between them being not quite a mile wide. Sand Point is the westernmost point. Its position is Lat. 55°20′ N. and Long. 160°33′ W.

Port Clarence. A well protected bay of nearly circular form, 10–12 n. miles in diameter, ESE. 35 n. miles from Cape Prince of Wales. A long, low, narrow spit encircles the bay from S. to W., and then N., nearly to the north shore, under which the entrance lies. The position of Cape Spencer, the end of the spit, is Lat. 65°15′ N. and Long. 166°52′ W.

Prince William Sound. A large area of water and islands in the NW. part of the Gulf of Alaska and 160 n. miles west of Mt. St. Elias. Several large islands protect the seaward part of the sound, but there are three good channels leading into it. From the eastern to the western parts, it is 80 n.miles in breadth, and from the SW. entrance to the mainland west of Port Valdés, it is 70 n.miles. It is notable for many deep fiords, penetrating the mountainous surroundings, and at the heads of most of the fiords, are glaciers, some coming down to the waters edge. Just east of the eastern entrance, the cold waters of the Copper River come down with much detritus in suspension. The waters of this sound are probably much colder than the adjacent waters of the Gulf of Alaska. The towns on the shores of Prince William Sound, at present, are Orca, a canning station in the eastern part (cf. above), Valdés, a mining camp, and Nutchek or Constantin, the old Russian trading establishment, near the eastern entrance. The position of the last is Lat. 60°20′ N. and Long. 146°53′ W.

ALASKA—(*continued.*)

Safety Harbor. Just east of Cape Nome, on the north shore of Cape Nome, is a small and shoal bay or lagoon, lying between the beach and the foot of the gravel diggings behind it. It is connected directly with the ocean. It is frozen all winter. The entrance is less than 10 miles east of Cape Nome and its position is Lat. 64°27′ N. and Long. 164°45′ W.

Saldovia. A small settlement on the small Bay of Chesloknu, which is 8 n. miles to the northeast of Port Graham at the SW. point of the entrance to Kochemak Bay, which, in turn, opens broadly upon Cook Inlet. Its position is Lat. 59°27′ N. and Long. 151°39′ W. Saunders collected at this locality and has recorded it (1901) as "Seldovia," which we have followed. The correct spelling, according to Professor Davidson, is "Saldovia," as above.

Sand Point. Sand Point stretches out from the NW. part of Popof Island, one of the Shumagin Group, towards the NE. part of Unga Island, and narrows the strait. Its position is Lat. 55°20′ N. and Long. 160°33′ W.

Sannak Island. This is the southwesternmost of the many islands lying off the southeast coast of the Peninsula of Alaska and the outermost one off the Strait of Isanof. It is surrounded by dangerous reefs. The position of Unimak Cove, on the north side, is Lat. 54°27′ N. and Long. 162°40′ W.

Seldovia. See Saldovia.

Shumagin Islands. This group of twelve large, high islands was first visited by Bering in the first week of September, 1741. They are embraced between Latitudes 54°43′ N. and 55°34′ N. and Longitudes 159°12′ W. and 160°50′ W., the general direction of the group being NW. and SE., but of the individual islands NE. and SW. The collections have been made chiefly, if not entirely, on the islands of Unga and Popof.

Sitka. The capital of Alaska, on the Island of Baranof, at the easternmost part of Sitka or Norfolk Sound. Its position is Lat. 57°03′ N. and Long. 135°18′ W.

Skaguay. A town near the head of Taiya Inlet, which is a prolongation of Lynn Canal. Its position is Lat. 59°27′ N. and Long. 135°19′ W.

St. Lawrence Island. A large island in the Bering Sea, 150 miles south of Bering Strait. It is 100 statute miles long ESE. to WNW. The position of the NW. cape is Lat. 63°53′ N. and Long. 171°30′ W.

St. Michael. An old trading post of the Russian Fur Company, on an island of the same name, close under the mainland, 60 miles north of the Aproon Branch of the Yukon river. Its position is Lat. 63°32′ N. and Long. 161°45′ W.

Alaska—(*continued.*)

St. Paul. The town of St. Paul and the anchorage are at the NW. part of Kadiak Island and are protected by the outlying islands, Near, Crooked, Holiday, Wooded, and Long or Bare Island, the last two being large ones. The town is often spoken of and written of, as Kadiak or Kodiak. Its position is Lat. 57°48′ N. and Long. 152°21′ W.

St. Paul Island. One of the Pribilof Islands in the southern part of Bering Sea and near the SW. edge of the 100-fathom plateau and in the cold water Yukon region. It is the breeding place of the Alaskan Fur Seal. Its position is Lat. 57°08′ N. and Long. 170°20′ W.

Summer Bay. This is a slight indentation in the eastern shore of the Bay of Unalaska, 2 miles ENE. from the extremity of the spit of Dutch Harbor (Lincoln Harbor or Ulakhta Harbor) and 3 miles NE. by E. from the village of Iliuliuk. Its position is Lat. 53°54′ N. and Long. 166°27′ W.

Unalaska. One of the largest of the Aleutian Islands, extending E. and W. through 80 miles, with the shore broken on all sides by deep fiords, and containing several native villages and good harbors. The principal harbors are in the vicinity of the Bay of Unalaska, especially Dutch Harbor, Captains Bay, and Iliuliuk. The position of Cape Kalekhta, the NE. point of approach to the bay, is Lat. 53°59′ N. and Long. 166°18′ W.

Unga Island. One of the Shumagin Islands off the SE. coast of the Peninsula of Alaska, about 20 miles in length. There is a moderately deep harbor at the SE. arm, the Bay or Harbor of Delarof, about 2 miles in depth and ¾ of a mile in breadth. The position of the entrance is Lat. 55°10′ N. and Long. 160°25′ W.

Uyak Bay. On the northwestern shore of Kadiak Island, with the entrance 9 miles open to the north. It is 30 geographical miles deep. Inside the SE. point of entrance are two islands with an anchorage under the inner one, 7 miles from Cape Uyak. The larger one is known as Harvester Island. Its position is Lat. 57°39′ N. and Long. 153°56′ W.

Valdés. A mining town on a glacial delta at the head of Port Valdés, an inlet at the extreme northeastern part of Prince William Sound. Its position is Lat. 61°06′ N. and Long. 146°26′ W. The postoffice at the town is known as Valdez.

Virgin Bay. At the SE. side of the entrance to Port Valdés, lies Bligh Island (of Vancouver), which is really three islands lying close together, and on the mainland, protected by this group, are three small bays. The middle one has copper works on the south side, and this is the Virgin Bay of the Harriman Expedition of the summer of 1899. At the northwestern point of this small bay is the native village of Tatitlack, whose position is Lat. 60°50½′ N. and Long. 146°48′ W.

Wrangell. On the north point of Wrangell or Etolin Island and 8 miles south from the southern mouth of the Stakheen River. Its position is Lat. 56°28′ N. and Long. 132°22′ W.

ALASKA—(*continued.*)

Yakutat. A town and postoffice, inside of Ocean Cape, on the shores of Yakutat Bay, 4 miles east of the Cape. Its position is Lat. 59°33′ N. and Long. 139°40′ W.

Yakutat Bay. A broad, open bay about 60 miles ESE. from Mt. St. Elias. The low gravel shores on the west side drain part of the Malaspina Glacier. The southeast point of entrance is Ocean Cape, whose position is Lat. 59°33′ N. and Long. 139°48′ W.

BRITISH COLUMBIA.

Banks Island. The westernmost of the islands lying off the mainland in the latitude of 52°–54° N., and forming in part the eastern shore of Hecate Strait, Queen Charlotte Archipelago forming the western. The island is 41 miles long and 5-10 miles wide, with the shores broken into bays and creeks. Calamity Harbor at the southern end is in Lat. 53°10′ N.

Burrards Inlet. Opening into the Gulf of Georgia at the northeastern part and just inside is the town of Vancouver, the terminus of the Canadian Pacific railroad. The position of the light-house is Lat. 49°17′14″ N. and Long. 123°15′08″ W.

Departure Bay. This is a coal harbor, on the eastern shore of Vancouver Island, and the northern part of Nanaimo Harbor. Its position is Lat. 49°12′ N. and Long. 123°58′ W.

Esquimalt. A small harbor just west of Victoria, on the southeastern coast of Vancouver Island. Its position is Lat. 48°25′50″ N. and Long. 123°26′45″ W.

Fort Vancouver. This is a locality given by Harvey (1852, p. 210). We supposed it to refer to Vancouver, B. C., but it probably refers to the Fort Vancouver on the Columbia River in Oregon.

Gonzales Point. Three miles east of Victoria. Position Lat. 48°24′ N. and Long. 123°18′ W.

Lowe Inlet. This small inlet opens on the Grenville Channel about 14 n. miles northwestward from the south entrance to the channel. Its position is Lat. 53°31′ N. and Long. 129°33½′ W.

Nanaimo. A small town on a small bay opening upon the Gulf of Georgia. Its position is Lat. 49°10′ N. and Long. 123°57′ W.

Nootka Sound. One of the deep bays or fiords on the western coast of Vancouver Island. The position of Friendly Cove, the old landing place within the Sound, is Lat. 49°36′ N. and Long. 126°37½′ W.

Oak Bay. A small shoal bay two miles north of Gonzales Point.

Pedder Inlet. A small bay near Cape Church, the southernmost point of Vancouver Island. It is nearly 10 miles SW. of Victoria.

Peddler Inlet. A misprint in the text for Pedder Inlet.

British Columbia—(*continued.*)

Point Roberts. Extends from the mainland westward into the Gulf of Georgia. The extremity of the point is in the State of Washington. Its position is Lat. 48°58′15″ N. and Long. 123°04′16″ W.

Port Renfrew. A new name given to the location on San Juan Harbor or Port San Juan, where the University of Minnesota has established a marine laboratory. It is variously mentioned under the names Minnesota Seaside Station, Baird Creek, Baird Cove, Baird Point, etc., as far as we understand the situation. It is about 60 or 70 miles to the west of Victoria.

San Juan Harbor. This is the first bay or harbor on the Vancouver Island side of the Strait of Juan de Fuca in approaching from the sea. Observatory Rocks, at the eastern head, are in Lat. 48°31′30″ N. and Long. 124°28′15″ W.

Straits of Georgia. The straits or more properly, the Gulf of Georgia, are between the mainland of Washington and British Columbia on the east and Vancouver Island on the west. The position of Point Roberts on the eastern side has already been given.

Strait of Juan de Fuca. This is the first large strait on the NW. coast of North America as one comes from the southward. Its western entrance lies between Cape Flattery in Washington and Cape Bonilla on Vancouver Island. The position of Cape Flattery, as determined at the light-house on Tatoosh Island, off the cape, is Lat. 48°23′15″ N. and Long. 123°43′51″ W.

Sumas Prairie. This locality is unknown to us.

Vancouver Island. A large island on the western coast of British Columbia, extending from Lat. 48°18½′ N. at the Strait of Juan de Fuca to Cape Scott in Lat. 50°47′ N.

Victoria. The capital of the province of British Columbia, situated in the southeastern part of Vancouver Island. Its position is Lat. 48°25′31″ N. and Long. 123°23′39″ W.

Una Nootka. Probably in the neighborhood of Nootka Sound, but not known definitely.

Washington.

Bog Lake. A small lake on Whidbey Island.

British Camp. The site of the British Camp is in the NW. part of San Juan Island. Its position is Lat. 48°35′ N. and Long. 123°10′ W.

Brown Island. This is a small island in Friday Harbor on the eastern shore of San Juan Island. Its position is Lat. 48°32′ N. and Long. 123°00′ W.

Camano Island. A long narrow island, lying off the eastern and southern part of Whidbey Island and the NW. point or shoulder is just east of

Washington—(*continued.*)

Penns Cove. This point, Point Demock, is in Lat. 48°15′ N. and Long. 122°32′ W.

Chambers Creek. Near the city of Tacoma, apparently not charted.

Channel Rocks. This name is used by Gardner in his collections, with the statement that the rocks are near Seattle, and it is also used by Miss Tilden, with the qualifying phrase, near Port Orchard. They are probably the same and lie in the narrow crooked channel leading from Admiralty Inlet to the southern part of Port Orchard. The position of the entrance of the south channel is Lat. 47°34½′ N. and Long. 122°32′ W.

Coupeville. A town, situated on the southern shore of Penns Cove, which is on the inside of Whidbey Island. Its position is Lat. 48°13′ N. and Long. 122°41½′ W.

Crocket's Lake. This is the marshy lagoon just east of Admiralty Head. A low gravelly beach separates it from Admiralty Bay. The position of the light-house on Admiralty Head is Lat. 48°09¼′ N. and Long. 122°41′ W.

Deer Harbor. A small town and bay, not charted, on the SW. side of San Juan Island.

East Sound. This is a fine sound nearly cutting Orcas Island in two. At the head of the sound is the village of East Sound. The position of the SE. point is Lat. 48°36′ N. and Long. 122°50′ W.

Fairhaven. This is a cannery and mill town in the northeastern part of Bellingham Bay, which, in turn, is the northeastern part of Washington Sound. Its position is Lat. 48°43′ N. and Long. 122°31′ W.

Fidalgo Island. This is a large high island at the northeasternmost part of the Strait of Juan de Fuca and forms the SE. side of Rosario Strait. It is separated from Whidbey Island by a narrow crooked strait called Deception Pass. The position of the SW. point, at Deception Pass, is Lat. 48°25′ N. and Long. 122°40′ W.

Fort Nisqually. This is an old post of the Hudson Bay Company at the mouth of the Nisqually River which empties into Puget Sound at its Great Southern Bend. Its position is Lat. 47°03′ N. and Long. 122°39′ W.

Friday Harbor. On the eastern shore of San Juan Island, about midway from the SE. and NW. points. The position of Friday Harbor Village is Lat. 48°32′ N. and Long. 123°01′ W.

Griffin Bay. The SE. extremity of San Juan Island swings well into the east and on the eastern side, just north of the entrance of San Juan Channel, there is a curve of the shore, 4-5 miles in length called Griffin Bay. The position of the village of San Juan on this shore is Lat. 48°28′ N. and Long. 123°00′ W.

Hog Island. A small island, not named on the charts, near LaConner.

Idlewild. Not known to us, but probably a summer resort. It is said to be on San Juan Island.

Washington—(*continued.*)

Keyport. A station where experimentation with oysters is being carried on, on the west side of Port Orchard, between the north and south entrances.

LaConner. This town is on the east side of the southern extremity of Swinomish Slough which forms the eastern boundary of Fidalgo Island. The position of the light-house at LaConner is Lat. 48°23′ N. and Long. 122°30½′ W.

Lake Washington. This lake lies parallel to the Admiralty Inlet and 4-6 miles to the eastward. The position of the southern extremity of the lake, where the Black River leaves it, is Lat. 47°29′ N. and Long. 122°14′ W. Seattle lies on the middle part of the western shore.

Ludlow Bay. The more proper designation, geographically, is Port Ludlow. It is on the west side of Admiralty Inlet, just at the broad entrance to Hoods Canal. The position is Lat. 47°55½′ N. and Long. 122°41′ W.

Mats-Mats Bay. This is a very small bay at the northwest entrance to Port Ludlow (Ludlow Bay) and 2 miles north of the town of Port Ludlow. The position of Basalt Point, at the south side of the entrance, is Lat. 47°57½′ N. and Long. 122°40½′ W.

Minnesota Reef. As far as we can determine, this is a name applied by collectors from Minnesota University, to a small ledge more or less uncovered at low water, in Friday Harbor, San Juan Island.

Monroe's Landing. A local name for a locality very near Coupeville on Whidbey Island.

Mt. Vernon. A RR. town on the Skagit River. Its position is Lat. 48°25′ N. and Long. 122°20′ W.

Newhall. This village is on the eastern shore of East Sound of Orcas Island, 3½ miles north of the SE. point of entrance. Its position is Lat. 48°38½′ N. and Long. 122°52′ W.

New Whatcom. This is the coal city of Bellingham Bay at the northeastern part of Washington Sound. Its position is Lat. 48°45′ N. and Long. 122°49½′ W.

Nooksack River. A moderately large stream, one of whose mouths empties into Bellingham Bay, about 6 miles NW. from the city of New Whatcom.

North Bay. A small bay on the eastern shore of San Juan Island about 4½ n.miles from the southern entrance to San Juan Channel. The position of the south side of the head forming the north shore of the bay is Lat. 48°31′ N. and Long. 128°58½′ W.

Oak Harbor. A small bay and village on the eastern shore of Whidbey Island, at the head of Saratoga Passage, about 6 miles NE. from Coupeville. Its position is Lat. 43°16′ N. and Long. 122°42′ W.

WASHINGTON—(*continued.*)

Orcas Island. This is the largest of the islands lying between Vancouver Island and the mainland. It forms the northwestern shore of the Strait of Rosario. From N. to S., it is about 9 miles wide, and from E. to W., it is about 13 miles long. The position of Point Lawrence, on the eastern side, is Lat. 84°39½′ N. and Long. 122°44½′ W.

Penns Cove. This is small bay on the eastern side of Whidbey Island. The town of Coupeville is on the south side of the bay.

Pleasant Beach. A summer resort on the north side of Richards Passage, on Bainbridge Island, at the southern entrance to Port Orchard.

Port Angeles. This is also sometimes called False Dungeness and is on the southern shore of the Strait of Juan de Fuca, 55 n. miles inside Tatoosh Island. All the coast is either wooded high bluffs or rocky, but the sand spit, which forms this port is long and narrow, stretching out from the bluff in an ENE. direction. The position of the light-house at the eastern end of the spit is Lat. 48°08′21″ N. and Long. 123°23′42″ W.

Port Orchard. Port Orchard is on the "Great Peninsula" between Admiralty Inlet on the east and Hoods Canal on the west. It is a long narrow arm of these interior waters 14 n.miles long NNE. and SSW., with two entrances. The southern entrance is by a crooked channel, named Richards Passage, opening upon a western recess of the western shore of Admiralty Inlet, and the SW. tail is the U. S. Navy Yard, called the Puget Sound Naval Station whose position is Lat. 47°33½′ N. and Long. 122°39′ W.

Port Townsend. At the southeastern extremity of the Strait of Juan de Fuca and at the north entrance to Admiralty Inlet. The position of the light-house is Lat. 48°08′39″ N. and Long. 122°45′14″ W.

Puget Sound. Legally, all the waters inside the Strait of Juan de Fuca, Washington Sound, Admiralty Inlet, Hoods Canal, etc., are known as Puget Sound. Vancouver, however, gave the name to the waters at the southern part of all these channels from Port Defiance in Lat. 47°19′ N. to the head of all at Olympia, in Lat. 47°02′ N. As a general designation in popular usage, the term is coincident with, or even somewhat more extensive than the legal application.

Renton. This is a town at the southern end of Lake Washington, where the waters drain off into the Black River. Its position is Lat. 47°29′ N. and Long. 122°14′ W.

Roach Harbor. An incorrect spelling in the text for Roche Harbor, which is a small village and harbor on the northwestern shore of San Juan Island. The position of the village is Lat. 48°36½′ N. and Long. 123°09′ W. The entrance to the harbor is protected by Henry Island.

Sackmans Point. Not named on the charts, but near Tracyton.

Washington—(*continued.*)

San Juan Island. A large, high island, 15 miles NW. and SE., which forms the SW. side of the S. entrance of the Canal de Haro and extends to a point near Victoria, B. C. The position of the SE. point is Lat. 48°27′ N. and Long. 122°58½′ W.

Seattle. A large city, situated on Elliots Bay, which opens on Admiralty Inlet, 45 miles from the Strait of Juan de Fuca. The position of the light-house is Lat. 47°39′43″ N. and Long. 122°26′03″ W.

Snakalum Point. On the east coast of Whidbey Island, about 3 miles east from Coupeville.

Swantown. A local name for a place on the west coast of Whidbey Island, about 10 miles north of Coupeville.

Tacoma. This is a city at the SW. angle of Elliot Bay, which opens to the NW. upon Admiralty Inlet. The position of the front of the city is Lat. 47°16′ N. and Long. 122°27′ W.

Tracyton. This is a village on the western side of the Port Washington Narrows which connect Dyer Inlet on the NW. with Port Orchard. The position is Lat. 47°36′ N. and Long. 122°39′ W.

Whidbey Island. A long island forming the eastern extremity of the Strait of Juan de Fuca. The position of the extreme western point is Lat. 48°12′55″ N. and Long. 122°45′31″ W.

Siberia.

Bering Island. A large island, the westernmost of the Aleutian Islands, 95 miles from the nearest cape of Kamtschatka. The position of the NW. point is Lat. 55°18′ N. and Long. 165°42′ E.

Konyam Bay. This bay is the northwesternmost of the bays which open on the Strait of Seniavin. It opens to the SE. upon that strait, but 6 miles in front of it is the island of Ka-y-ne or Arakamtchetchene. Lütke calls the bay Penkegnei and this name is found on the charts. The position of Cape Netchkonome, the N. point of entrance, is Lat. 64°49½′ N. and Long. 172°44½′ W.

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PLATE 17.

Collinsiella tuberculata Setchell and Gardner gen. et sp. nov.

1. Habit of No. 403, N.L.G., from Whidbey Island. (× 40)
2. Vertical section through one of the fronds. (Zeiss 2 × A)
3. Dissection of a portion of the vertical section which has been treated with Chloriodide of Zinc, to show the branching. The cell contents are much shrunken. (Zeiss 2 × D)
4. Tangential section at the surface to show the division planes. (Zeiss 2 × D)
5. Young terminal cell, untreated, showing the chromatophore lining the wall and the solitary pyrenoid. (Zeiss 2 × D)
6. Similar view of an older cell, showing the vacuolate appearance of the chromatophore. (Zeiss 2 × D)
7. Similar view of still older cell, showing the decrease in size of the chromatophore and a double pyrenoid. (Zeiss 2 × D)

Codium Ritteri Setchell and Gardner sp. nov.

8. Habit of the type specimen. (nat. size)
9. A common shape of the adult utricle. (Zeiss 2 × A)
10. A common shape of the adult utricle. (Zeiss 2 × A)
11. An uncommon, yet not rare, shape of the adult utricle. (Zeiss 2 × A)

Rhodochorton subimmersum Setchell and Gardner sp. nov.

12. A section through the host plant, showing the horizontal immersed filament of the Rhodochorton and the vertical emergent filaments, as well as the terminal tetrasporangia. Specimen No. 289, N.L.G., from Whidbey Island. (Zeiss 2 × D)

All the figures of this plate were drawn under the direction of W. A. Setchell by H. N. Bagley. The size varies proportionally to the original, and in the case of microscopic details we shall mention here, as well as under the remaining figures, only the combination of the lenses used. The drawings have all been reduced to one-half the original diameter, but the magnifications, where given, refer to the figures as reduced.

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PLATE 18.

Colpomenia sinuosa f. deformans Setchell and Gardner f. nov.

13. Habit of a plant showing only a comparatively slight and uniform lobing. Original from Pt. Carmel, Monterey County, California. (nat. size)
14. Habit of a plant from the same spot as the preceding, showing the tendency towards unequal lobing. (nat. size)
15. Habit of a group of plants of the type of the form. Any one of these plants may be separated and become the *Scytosiphon bullosus* Saunders. (nat. size)

Chordaria abietina Ruprecht.

16. Habit of a group of very young plants, showing the horizontal lobed thallus, whence the young vertical thalli are arising. Original material from Point Carmel, Monterey County, California. (a little more than natural size)
17. Habit of a plant just reaching the adult condition, showing the relation between the horizontal and vertical thalli. From the same place. (nat. size)

Constantinea Sitchensis P. & R.

18. Habit of a young plant, showing the method of producing the new blade by the appearance, at first, of a subulate projection in the center of the old blade. Original material from Whidbey Island. (about one-half nat. size)

Constantinea simplex Setchell.

19. Habit of a plant from Fort Ross, California, showing the first stages of the production of the new blade by the rosulate process. (about one-half nat. size)
20. Habit of a plant in which the process of producing the new blade is farther advanced. (about one-half nat. size)
21. Habit of plant still farther advanced. (about one-half nat. size)

All the figures were drawn under the direction of W. A. Setchell. Figures 13–17 were drawn by H. N. Bagley, and the rest by A. A. Lawson.

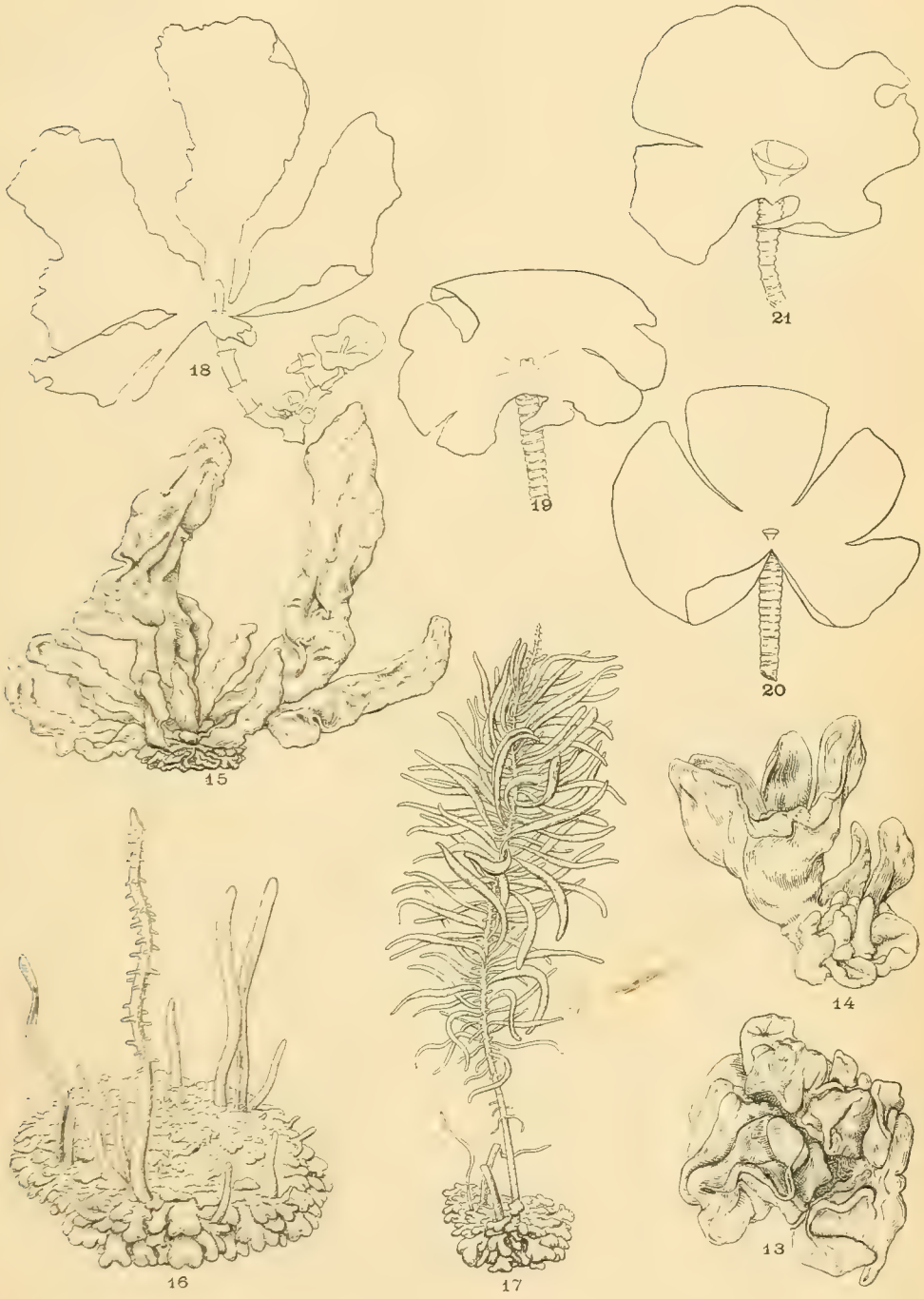

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PLATE 19.

Oscillatoria splendida f. uncinata Setchell and Gardner f. nov.

22. Tip of specimen from Oak Harbor, showing a slight tendency toward uncinate form. (×1000-1500)
23. Tip of another specimen from the same locality and of the same magnification, showing a spiral twist.
24. Tip of another specimen from the same locality and of the same magnification, showing the extreme bending.

Pterosiphonia arctica (J. Agardh) Setchell and Gardner comb. nov.

25. Habit of portion of robust specimen from Unalaska. (nat. size)
26. Tetrasporic branchlet. (Zeiss 2 × D)
27. Cross section through the base of a branchlet. (Zeiss 2 × D)

Sarcophyllis pygmæa Setchell comb. nov.

28. Habit of a group of very young plants, showing the horizontal thallus with the young vertical fronds arising just within the margins. (nat. size)
29. Habit of young plant, showing the symmetrical horizontal thallus with two erect fronds about half grown. (nat. size)

Fauchea Gardneri Setchell.

30. Habit of a portion of the frond of a tetrasporic plant, showing the size, shape, and relative arrangement of the sori. (nat. size)

All the figures were drawn under the direction of W. A. Setchell and N. L. Gardner. Figures 28 and 29 were drawn by A. A. Lawson, the rest by H. N. Bagley.

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PLATE 20.

Hedophyllum subsessile (Areschoug) Setchell.

31. Habit of a half grown plant, showing the very short and stout stipe with its holdfast, the thickened base of the original blade from which the central portion has worn away, and the two blades borne on either side. The thickened base of the old blade gives off hapteres, some of which are shown in the figure. (about one-half nat. size)

Drawn by A. A. Lawson, under the direction of W. A. Setchell.

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PLATE 21.

Alaria valida Kjellman and Setchell sp. nov.

32. Habit of No. 111, N.L.G., from Whidbey Island. ($\times \frac{1}{6}$)
33. Cross section of the midrib of the same plant. ($\times 2\frac{1}{2}$)

Drawn by H. N. Bagley, under the direction of W. A. Setchell.

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PLATE 22.

Alaria tenuifolia Setchell.

34. Habit of the type of the species, No. 3286a, from Amaknak Island. This is a plant not fully grown. ($\times \frac{1}{4}$)
35. Cross section of the stipe 15 mm. above the base. ($\times 2\frac{1}{2}$)
36. Cross section 10 cm. above the base and 5 cm. below the beginning of the rhachis, to show the flattening. ($\times 2\frac{1}{2}$)
37. Cross section of the midrib. ($\times 2\frac{1}{2}$)

All the figures were drawn by H. N. Bagley, under the direction of W. A. Setchell.

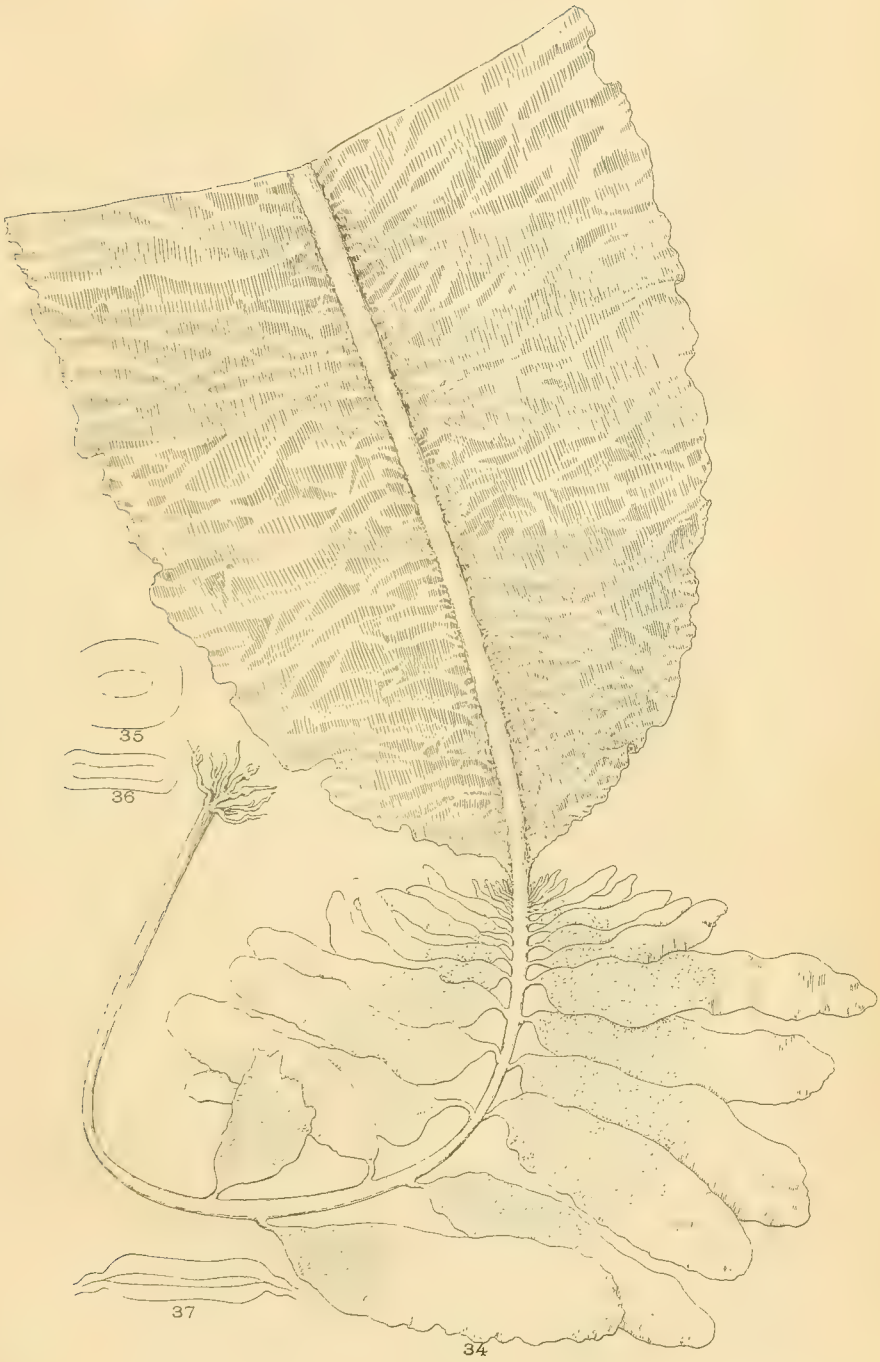

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PLATE 23.

Whidbeyella cartilaginea Setchell and Gardner gen. et. sp nov.

38. Habit of the type specimen. ($\times \frac{1}{2}$)

Anatheca furcata Setchell and Gardner sp. nov.

39. Habit of the type specimen. (nat. size)

Both figures were drawn by H. N. Bagley, under the direction of W. A. Setchell.

PHOTO-LITH BRITTON & REY, S.F.

PLATE 24.

Whidbeyella cartilaginea Setchell and Gardner gen. et. sp. nov.

40. Cross section through the frond of the type specimen, showing the the structure of a young cystocarp. (Zeiss 2 × D)

Anatheca furcata Setchell and Gardner sp. nov.

41. Cross section through a cystocarp, showing the placenta, the masses of spores, and the filaments connecting the placenta with the tissues external to it. (Zeiss 2 × D)

Both figures were drawn by H. N. Bagley, under the direction of W. A. Setchell.

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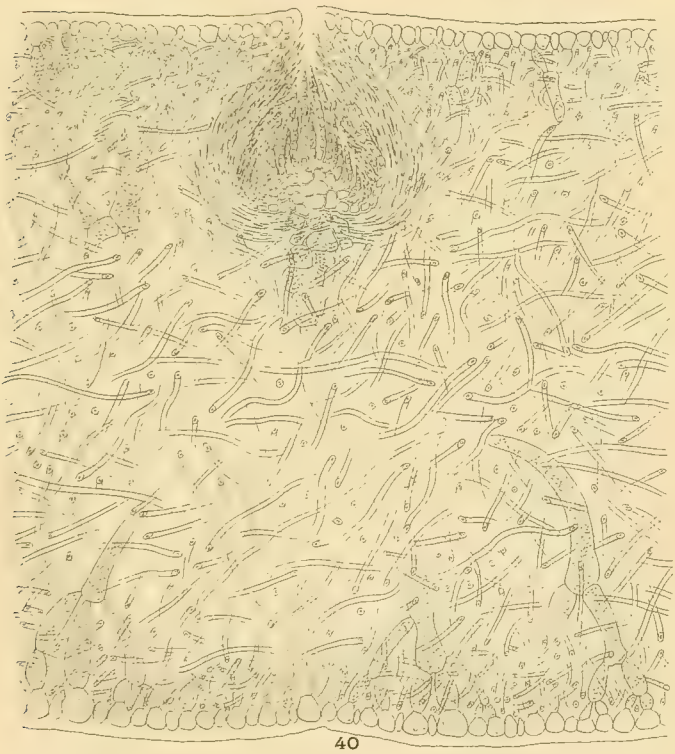

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PLATE 25.

Platythamnion heteromorphum f. reversum Setchell and Gardner f. nov.

42. Portion of the tip of a plant from Whidbey Island, showing the arrangement of branches and branchlets. (Zeiss 2 × D)

Fauchea laciniata J. Agardh.

43. Portion of a tetrasporic plant, showing the habit and the arrangement and shape of the sori. (nat. size)

44. Outline of a portion of a cystocarpic plant, showing the extreme of laciniate margin. (nat. size)

All the figures were drawn by H. N. Bagley, under the direction of W. A. Setchell.

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PLATE 26.

Odonthalia semicostata (Mertens) J. Agardh.

45. Habit of sterile but characteristic plant from Whidbey Island. (nat. size)

Drawn by H. N. Bagley, under the direction of W. A. Setchell.

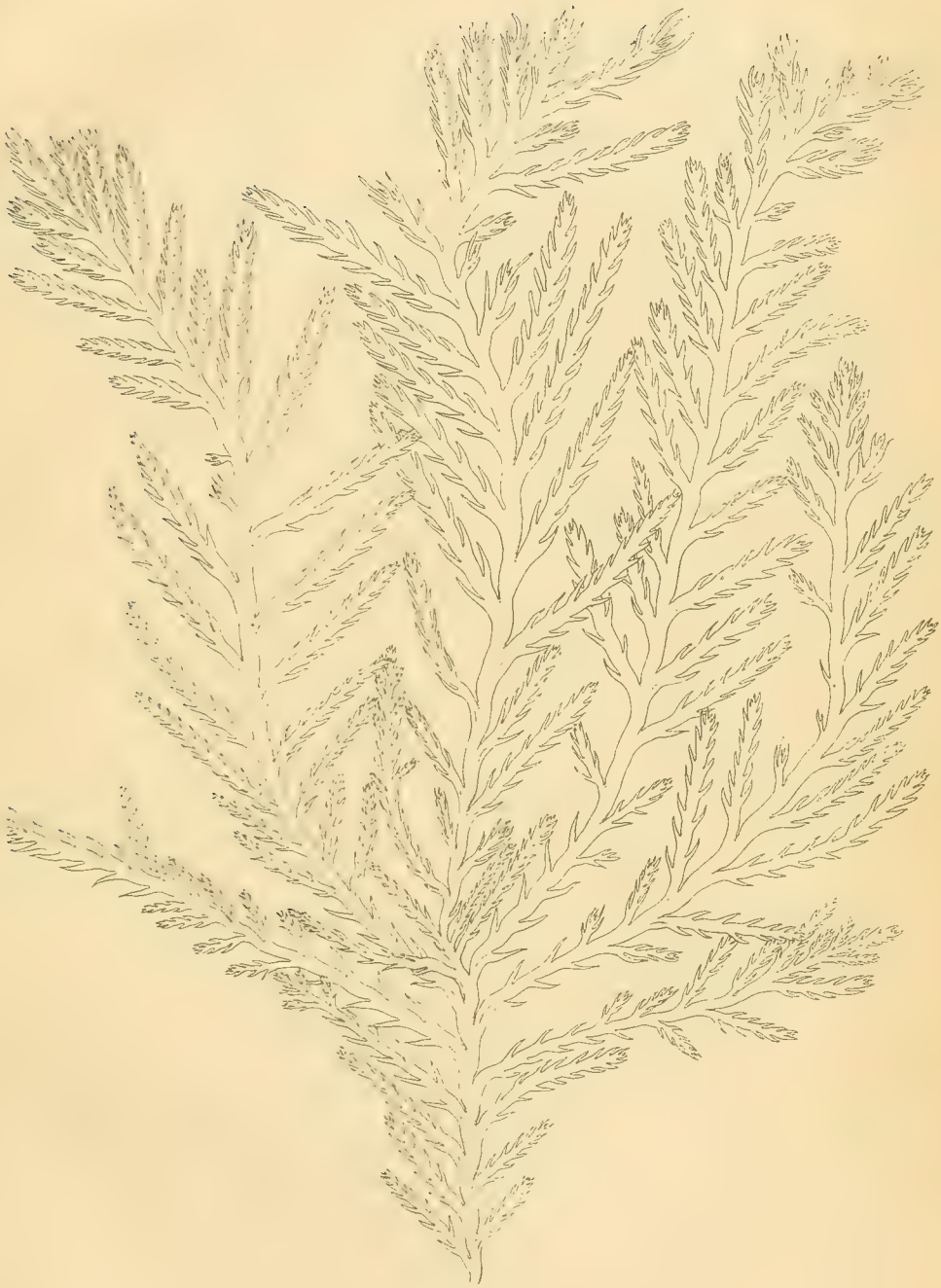

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PLATE 27.

Odonthalia semicostata (Mertens) J. Agardh.

46. Habit of a pinnule bearing cystocarps. Such pinnules are always more or less eroded. (× 1½)
47. Portion of a cystocarpic glomerule. (× 5)
48. Portion of a cystocarpic glomerule. (× 5)
49. Portion of a tetrasporic glomerule. (× 10)

Odonthalia floccosa (Esper) Falkenberg.

50. Pinna of an antheridial plant, showing the aggregation of the antheridial branchlets in a terminal glomerule. (× 5)

Odonthalia Lyallii (Harvey) J. Agardh.

51. Portion of a tetrasporic plant. (nat. size)
52. Tetrasporic pinnule. (× 5)
53. Portion of a cystocarpic pinna. (× 3)

All the figures were drawn by H. N. Bagley, under the direction of W. A. Setchell.

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